2/9/27

Vol. XXV. Part 8.

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The Journal of the Department of Agriculture of Victoria, Australia.

August, 1927.

PRINCIPAL CONTENTS

Pigs for Bacon Production
Sulphuring Dried Fruit
Chicken Rearing
Hygiene in the Poultry Yard
Passion Fruit Culture
Fertilizers for Potatoes
Storing of Lemons
Lamb Marking

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OF

THE DEPARTMENT OF AGRICULTURE,

VICTORIA, AUSTRALIA.

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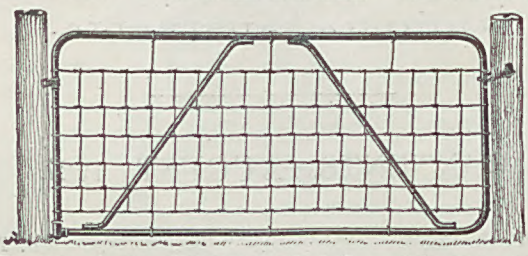

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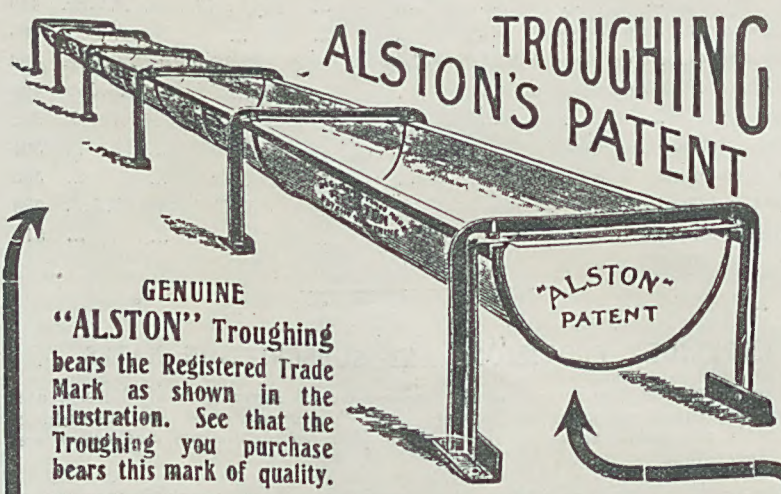

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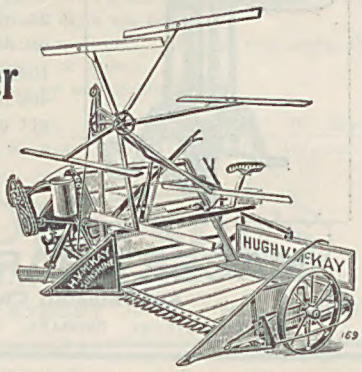

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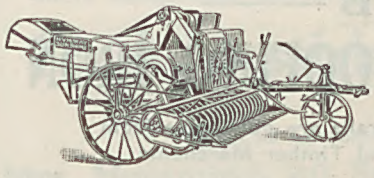

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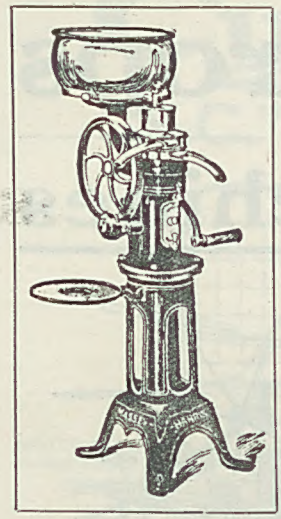

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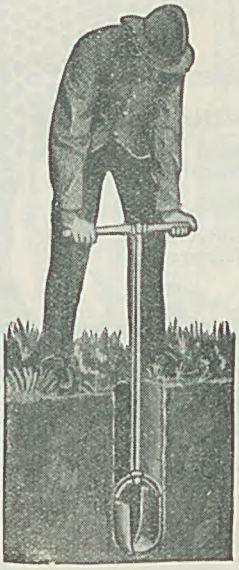

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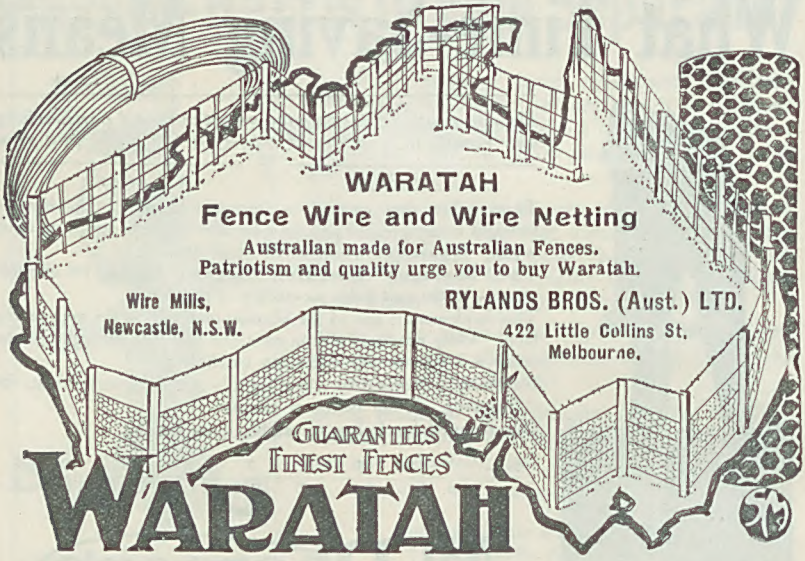

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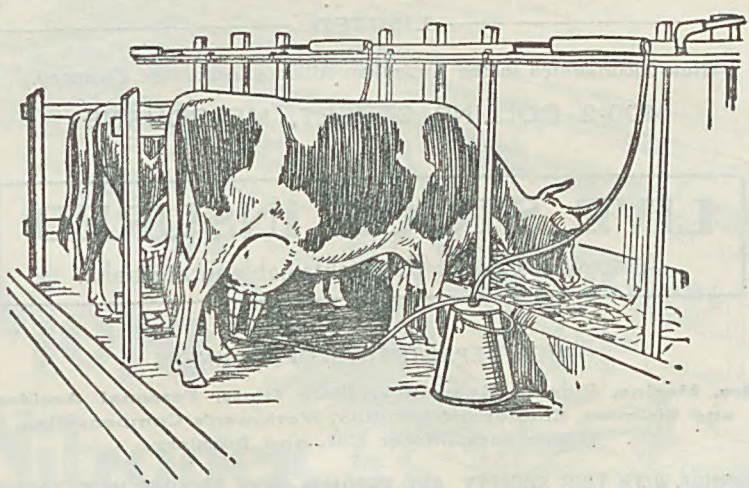

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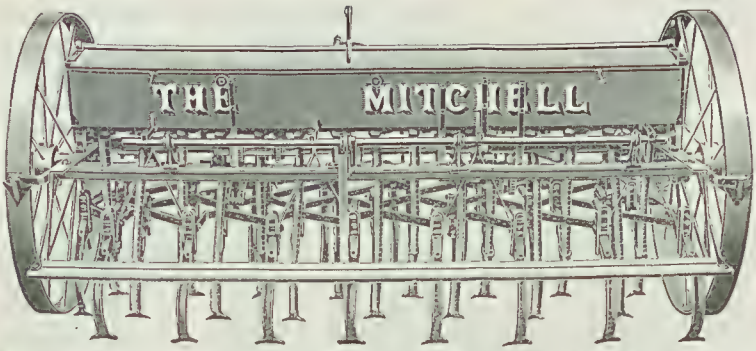

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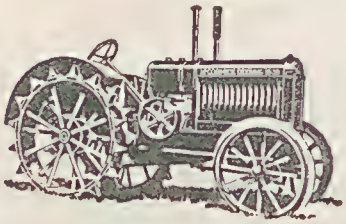

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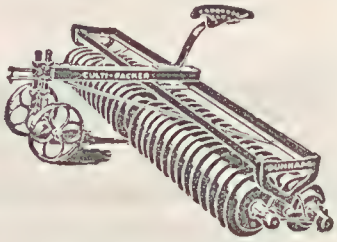

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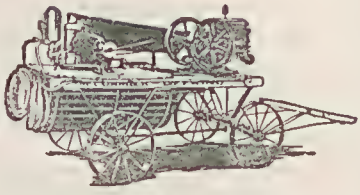

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PIGS FOR BACON PRODUCTION.

THE BEST BREEDS.

By R. T. Archer, Chief Dairy Inspector.

One of the greatest needs at the present time is uniformity in the class of bacon produced. It is necessary that the popular taste be considered and catered for. If this were done the local consumption would be rapidly increased, in fact, doubled. Australia has the lowest bacon consumption *per capita* recorded, viz., 11.5 lb. per annum. It has been said that the Australian climate is too hot for its people to be large consumers of bacon, yet our climate is somewhat similar to that of Argentina, where the consumption is 24 lb. *per capita*. In Britain it is 41.8 lb., United States of America, 77 lb., and Canada 87.7 lb. The truth of the matter is that in this country it is difficult to obtain a sufficiency of the quality of bacon that suits the taste of the consumer. As soon as we provide for this, there is no doubt that the consumption will increase enormously, and it must be recognized that the local market is the most lucrative, and well worth catering for.

The bacon demanded by the consumers to-day is that which is young, juicy, tender, mild cured, with a big percentage of lean interspersed with a minimum of fat. It coincides exactly with the quality in favour with the British consumer, except that rather heavier weights are acceptable there than here. Britain provides the most important outlet for any surplus we might have, and it would find a ready market there, for though absolutely the best bacon in the world is produced in Great Britain, only 25 per cent. of the total is of choicest quality, and there is a demand for more. English choicest bacon commands the highest price, with Irish a close second.

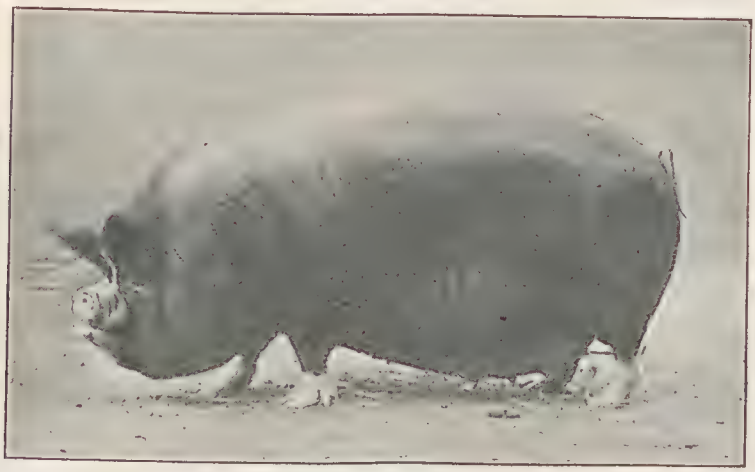
How is the Bacon Type to be Produced?

Lack of uniformity is the great fault. This is largely due to multiplicity of breeds which vary in type, and are mostly not suitable for

the production of a high class product. The bacon type is that which produces the bulk of the meat in the most valuable parts, and the least weight in those parts which are of lower quality and value. In short, nearly all the meat behind the girth or shoulder is worth about twice as much as that in front of the girth. Some breeds are noted for a great crest on the neck, heavy shoulder and jowl, the production of which represents a waste of good food. Others have light neck, shoulders, and jowl, are narrow at the wither, getting heavy towards the hindquarters, and have a long side, thick flank, and full thigh. This is the bacon type. How are we to produce it?

The Bacon Industry in Denmark.

Besides our own experience as published in this *Journal*, we have the experience of those countries which have built up a valuable industry. Of these Denmark is the most important, and has led the way.



Berkshire Sow.

Last year she exported to Britain £22,000,000 worth of bacon. On account of its uniformity and good quality, Danish bacon practically controls the market. Prior to 1887 almost all the Danish pigs went to Germany. Then the importation of live pigs to that country was prohibited, so the Danes had to look for a fresh outlet. Then it was found that the Large White Yorkshire, or Large White as it is now called, was the pig that was producing the class of bacon which commanded the highest price. So it was decided to import some of these pigs from Britain and establish breeding centres. These were subsidized by the Government so that boars could be made available at a reasonable price to farmers for the improvement of the Landrace or native breed of pigs. This has enabled Denmark to build up her bacon industry.

As soon as other countries saw what a success the Danes had made of their industry, delegations were sent to inquire into their methods.

Scotland was the first; then Ireland, and then Canada, with the result that there has been a great improvement in the quality of the bacon of these countries. The United States of America is the latest country to adopt the system, and the largest bacon-curers in America pay a premium of one penny per pound for pigs sired by the Large White.

Bacon Industry of England and Ireland.

In England there are thirteen distinct breeds of pigs registered. These vary a great deal in conformation; it is this which accounts for the lack of uniformity in British bacon, and it is recognized and recommended by the bacon-curers that the Large White boar should always be used for the production of pork or bacon.

In 1914 the Irish bacon industry was in such an unsatisfactory state that the Government appointed a Royal Commission to investigate the

Middle York.

reason. Evidence was taken from every section of the community, with the result that the Danish system was adopted and breeders subsidized. But the subsidy was restricted to two breeds, viz., the Large White Yorkshire for the best South of England trade, and the Large White Ulster for the Northern trade. The bacon-curers, in giving evidence, stated that they had tried all the improved breeds of pigs, with the result that they had eliminated all but the Large White Yorkshire, and they had been breeding these for years, and distributing boars amongst their clients for the production of the pigs, which enabled them to deliver the quality of bacon on the most critical market—London—where the highest price was to be obtained. Now the Irish bacon is sold at only two or three shillings below the best English.

Some years ago Messrs. Harris Bros., one of the leading English bacon-curing firms, decided to breed Tamworths, as they were the bacon type, light in the shoulder, neck, and jowl. They soon found they had made a big mistake, and they got rid of all the Tamworths, and established studs of Large White, and distributed boars to their clients with very satisfactory results.

Last year the English Government published a very comprehensive report on the "Marketing of Pigs." In this publication it is advised that the Large White boar be always used either on the Middle York, the Berkshire, or the British Black sow. In this way pigs suitable for either pork or bacon can be bred, and if the pork market is favorable, they are killed for pork, or else they are retained and sold later for bacon.

How the Australian Breed can be Improved.

In Australia the Berkshire has always been a popular pig, but for many years the Middle York has about shared its popularity. It is very similar in type, but more prolific, and being white is preferred by the curers. So it may be asked, what is wrong with these breeds? They are highly improved breeds, but have some very serious faults which we can very largely correct by using the Large White boar.

Large White Boar.

Take the Berkshires. The most serious faults with them are that they carry too much weight in front of the girth, and they have too thick a layer of fat, frequently two to three inches, on their backs. They have generally small litters, although certain strains are satisfactory from this point of view, and being black there is frequently loss from seedy cut. Their best feature is their plump full hams. If crossed with the Large White the progeny will be fit to produce bacon of suitable weight in from a month to six weeks sooner than will the pure Berks. Further, they are all white; they have not the excessive thickness of back fat, and there is no seedy cut.

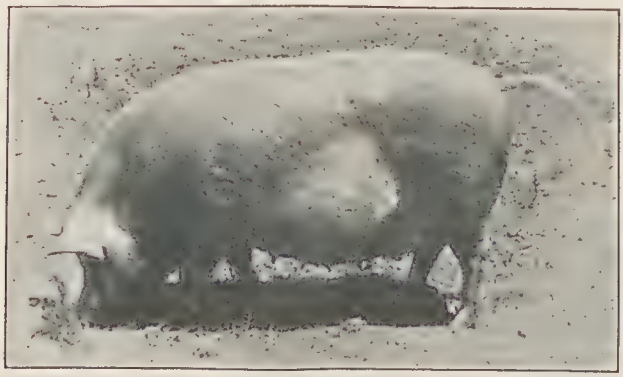
Then take the Middle York. They have far too much weight in front of the girth and too great a thickness of fat. They are prolific, and good mothers, have good hams, no seedy cut, and being white look cleaner and brighter when cured. They cross well with the Large White. To the British Black or Large Black, as they are sometimes

called, there is the same objection as there is to all black pigs. They are much lighter in front of the girths than the two breeds previously mentioned. They are very prolific, good mothers, and cross well with the Large White.

The more breeds we have the farther away from uniformity shall we be. For instance, there are the Poland China and Duroc Jersey, two of the recognized American lard type, and not suitable for the production of Grade "A" bacon. The Gloucester Old Spots sows may be put to the Large White boar, and the progeny would be improved bacon pigs, but all the same very heavy in the bone and deficient in the ham.

A Scottish View.

Quite recently the Scottish Agricultural Organization Society published a report of a Conference held to consider the development of the Scottish Pig Industry. The Society has issued the following preliminary statement:—"After exhaustive inquiry throughout all branches of the industry at home, and after a careful study of the experiences



Large White Sow

and results in the leading countries of pig production abroad, it is demonstrated beyond question that for commercial purposes in Scotland, breeders should confine their efforts to the following one pure breed and three first crosses:—Large White; Large White—Middle White cross; Large White—Berkshire cross; Large White—Large Black cross; in every case the sire to be the Large White."

Large White Pigs are not Subject to Sun Scald.

Finally, many people, especially in the north of Australia, are under the impression that because the pig is white it will be subject to sun scald. Experiments conducted in South Africa extending over two years prove satisfactorily that there is nothing to fear on this score. Moreover, Egypt is right on the equator and hotter than any part of Australia, yet the native pig in that country is white.

SHELTER FOR DAIRY COWS.

By N. R. Trewin, Dairy Supervisor.

While travelling the State on herd testing work I have particularly noticed the neglect of farmers to provide adequate winter shelter for their dairy herds. In many instances, even where there are no breakwinds or hedges, the cows are not provided with rugs.

The lack of breakwinds is most pronounced in the northern areas of the State, where the timber has been, to a great extent, removed. In that fine district around Tongala, across to Bamawm, and extending right through to Cohuna, there is land pre-eminently suitable for dairying, by reason of the fine quality of the soil; further, it has the distinct advantage of being irrigated. Unfortunately, in many cases there, cows have to face the bitter cold winds that sweep across those open spaces in winter, with very little, if any, protection at all; the farmers contending that it does not pay to buy rugs, and that the growing of trees for shelter spoils too much valuable land.

It must be remembered that the cow is a warm-blooded animal, her normal temperature being 101.5° F. This heat is, of course, supplied by the animal's food, about 50 per cent. of the food eaten being required for the maintenance of the body and for the nourishment of the unborn calf, and the balance is available for the production of milk.

It is comparatively easy in summer, with a temperature ranging from 85 to 100°, for the blood to be kept at the required heat, but when the thermometer drops to 50, or even 40°, then the animal should be given some protection from the cold, otherwise she will have to draw unduly on her body reserves. Although nature provides in a small measure for the rigours of winter by promoting an increased growth of hair, yet it will readily be seen that any artificial means adopted for shelter and warmth will mean a saving in feed, and consequently a reduction in expenditure at a time of the year when returns usually are small and the outlay heavy.

RUGGING.

Human beings invariably don warmer and heavier clothes as the cold weather approaches. The clothes in themselves are not warm, but the greater our covering the less bodily heat escapes. It is the same with the lower animals, and if good rugs be provided the animals will be kept warm and healthy. If cows are not given shelter, much of their food is used to maintain the body at the right temperature, and their milk yield quickly diminishes.

It is frequently said that rugging is too costly. Certainly, to buy rugs for a herd of 20 or 30 cows at 30s. each represents a fair sum of money, but with a little attention, such as mending or patching, the average life of a rug would be about five years, possibly more, as they are used only for a few months in the year. This would

mean about 6s. per cow per year; but when one considers that it is a common occurrence in inclement weather for heavy milking cows to drop as much as 8 lb. of milk in a day, not once in the season but perhaps many times, and when this is balanced against the cost of rugging, I think it must be conceded that rugging is cheap. Of course, the rugs will not entirely prevent a falling off in the milk yield, but the decrease will be considerably lessened.

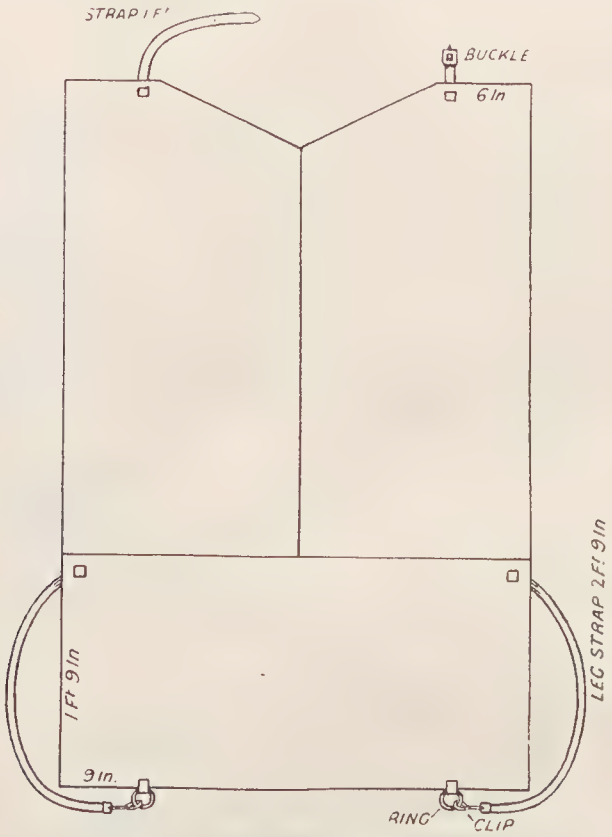


Diagram of a Rug made from Two Corn Sacks.

The front part consists of one bag, cut open lengthwise. The back part is one whole sack; this gives a double thickness over the animal's loins—part most susceptible to cold. Two leg straps, a breast strap, two clips, two rings, and a buckle complete the rug. (One woolpack will make two rugs.)

If the farmer's financial position will not permit him to buy good rugs for his stock, then he should make bag rugs himself. In fact, this is the most profitable way of disposing of surplus bags on a dairy farm. A very useful and serviceable rug can be made from two corn-sacks, and when worn for a time it will become well coated with hair and grease from the skin, and, in addition to providing considerable warmth, will keep out a lot of rain.

Breakwinds, Hedges, etc.

Rugging alone is not sufficient, and some shelter should be provided in the paddocks.

There is a good deal of sound sense in the argument often brought forward that shelter trees spoil too much land, through drawing moisture and nutrient from the soil, and that the benefit derived by the stock does not sufficiently compensate for the loss of pasture, particularly if the land is sometimes used for cultivation. The farmer certainly cannot afford to plant trees indiscriminately over his property, but it would pay him handsomely to plant a couple of breakwinds, or else he should have hedges along the fence on the side of his farm from which the prevailing winds and bad weather come.

It is a significant fact that the herds giving the best results in the Government Herd Test are those which are always rugged during the winter and provided with ample shelter. As an instance, I would refer to the herd of Messrs. E. L. Smith & Sons, of Woodend, and probably in no dairying district in the State is the winter climate colder and more inhospitable than at Woodend. Yet the records of their cows are unsurpassed by any other cows under test, and it can scarcely be doubted that this success is, in a large measure, due to the shelter supplied by a splendid clump of trees—pines and lambertianas—on one part of their property, and to the thick furze hedges that surround the pasture paddocks.

Undoubtedly, the finest shelter hedge to grow is the lambertiana. It thrives well in almost any district, and the trees make an exceedingly thick and beautiful hedge, adding greatly to the appearance of a property, and, after all, improved appearance means enhanced value.

The various gums are also very suitable; a great advantage of these trees is that they can be lopped periodically, which serves the twofold purpose of causing the tree to grow bushy, and supplying the farmer with some firewood, which is a consideration in those parts where the natural timber has been thinned out. The sugar gum is probably the best of the numerous varieties obtainable. There are many hedge plants suitable to particular districts which, besides giving shelter during winter, furnish shade in the extremely hot weather.

In some districts shelter sheds are erected, and answer the purpose well, but there is always the liability in such a limited space of animals being horned, and, moreover, the material and labour required makes the cost of such a shelter, on anything like an extensive scale, prohibitive. Hedges are, in every way, preferable.

Cows that are well cared for, rugged, and have a reasonable amount of shelter look better, feel better, and give a much larger return of butter-fat at a smaller cost than do cows that have to meet the exigencies of winter without some covering, or, at any rate, the protection of a hedge or a clump of trees.

SULPHURING DRIED FRUIT.

(*W. R. Jewell, M.Sc., B.Met., F.I.C., F.A.C.I., Agricultural Research Chemist.*)

1.—APRICOTS.

Introduction.

All producers of dried fruits are vitally interested in the recent regulations of the Ministry of Health of Great Britain, prohibiting after 1st January, 1927, the importation into and sale within the United Kingdom of dried fruits which contain sulphur dioxide in excess of certain prescribed limits. For apricots, peaches, pears, apples, and nectarines, the limit is 14 grains of sulphur dioxide per lb., and for raisins and sultanas 5½ grains. The latter is not of immediate interest, as sulphuring of raisins and sultanas is not carried out in Victoria.

In order that the producer may be assured that his product will not be rejected, it is essential that some standard procedure be evolved which will give a dried product, with a satisfactory colour but without an excess of sulphur dioxide. Up to the present, widely divergent sulphuring methods have been in use, and an examination has shown that in many instances the resulting dried apricots contain sulphur dioxide very much in excess of 14 grains per lb. The Department of Agriculture has undertaken a series of experiments on a practical scale with a view to determining a standard sulphuring procedure for the guidance of growers. This article, the first of a series, describes the results that have been obtained with apricots. Other fruits will be dealt with in due course.

Necessity for Sulphuring.

Sulphuring, or the exposure of the cut fruit (spread on stacked trays) to the fumes of burning sulphur in an enclosed space is a preliminary to drying (either in a dehydrator or in the open), and is essential if the dried product is to have a satisfactory colour. Sulphuring does not actually bleach the fruit, but it fixes the natural colour and prevents darkening by oxidation during subsequent drying. This is its principal use, but, in addition, sulphuring is said to render the fruit more permeable to moisture, thus accelerating drying, and to act as a deterrent to insects and moulds during storage.

Sulphur dioxide forms sulphurous acid with the moisture on the fruit, and is absorbed by the fruit tissues. Part of the absorbed gas combines as sulphites with the sugar and other compounds of the fruit. During drying, the greater part of the sulphur dioxide is evaporated, and there is probably a further small loss during storage after drying. But a certain amount remains in the fruit, and, as will be seen later, this amount varies with the sulphuring method.

Factors Influencing SO_2 Absorption.

The amount of sulphur dioxide absorbed varies with a number of factors, the chief of which are as follow:—

1. The variety and maturity of the fruit.
2. The type of sulphur house.
3. The quantity of sulphur burnt per unit weight of fruit or per unit volume of air space.
4. The time of exposure to sulphur dioxide.
5. The amount of moisture on the cut surface.
6. The temperature in the sulphur house.

All the experiments described later were conducted under practical sulphuring conditions, i.e., they were carried out in commercial, full-size sulphur houses, with, in each instance, a full charge of fruit.

It was considered that results of more practical value could be obtained in this way than would be the case in small scale sulphur houses with greatly reduced charges. For instance, if experiments be made with reduced charges of fruit, the sulphur dioxide concentration (either per lb. of fruit or per cubic foot of space) must be very different from that in ordinary practice, depending on whether a full or a reduced amount of sulphur is burnt.

The amount of sulphur given in each case is the amount actually burnt, any sulphur remaining unburnt being deducted from the original weight.

Analyses were made five or six weeks after sulphuring, which would approximately represent the minimum period of time that would elapse between sulphuring and analysis by the Customs Department prior to export. An endeavour was made to select truly representative samples in each case.

1. Variety and Maturity of the Fruit.

It is stated that the results of sulphuring vary with the variety and maturity of the apricots. These experiments were all conducted with Moorparks, so that no direct evidence was obtained as to the former statement, but from contemporary literature it would appear that variations due to variety of apricots is very slight, and is too small to affect the general conclusions reached.

Sulphuring results do vary slightly with the ripeness of the fruit, but apricots for drying should be picked "eating ripe," and the appearance of the product will be affected if they are dried on the green side. From the few experiments conducted along these lines, greenish apricots require slightly longer exposure than do those "eating ripe" to obtain the same amount of residual sulphur dioxide.

2. Type of Sulphur House.

Two main types of sulphur house are in use:—

(*a*) practically airtight, either portable (malthoid covering over wooden frame), or permanent fixtures (of brick, fibro-cement sheets, &c.), and

(*b*) more or less permeable to gas, consisting of a wooden frame covered with hessian or bagging, generally lime-washed.

As would be expected, the results obtained vary with the type of house used. In the latter type, which allows a slow diffusion of sulphur dioxide into the atmosphere, larger amounts of sulphur and/or longer exposures are necessary to get the same results as are obtained in houses of the former type. Conversely, in houses of type (*b*) larger amounts of sulphur and longer times of exposure are possible, without leaving an excess of sulphur dioxide in the fruit, than is the case in airtight chambers.

The following two experiments are typical:—

Weight of sulphur per ton green fruit—8½ lb.
Time of exposure (night)—15 hours.
Apricots—Moorpark, "eating ripe."
Sulphur house, type (*a*)—22.5 grains sulphur dioxide per lb. in dried fruit.
Sulphur house, type (*b*)—10.2 grains sulphur dioxide per lb. in dried fruit.

With accurately controlled conditions, apricots may be more economically sulphured in an airtight house than in a hessian one, but in the latter more latitude is allowable without leaving an excess of sulphur dioxide in the dried product.

3. Quantity of Sulphur Burnt.

That the amount of sulphur dioxide in the dried fruit is dependent on the amount of sulphur burnt per ton of green fruit is shown in the following experiments, where quality of fruit, time of exposure, &c., were kept reasonably constant:—

(*a*) In airtight house—
Exposure (night)—15 hours:—
8½ lb. sulphur per ton—22.5 grains SO_2 per lb.
5 lb. sulphur per ton—14.0 grains SO_2 per lb.
Exposure (day)—6 hours:—
7 lb. sulphur per ton—14.1 grains SO_2 per lb.
3⅓ lb. sulphur per ton—10.6 grains SO_2 per lb.

(*b*) In hessian house—
Exposure (day)—4 hours:—
14 lb. sulphur per ton—10.2 grains SO_2 per lb.
5½ lb. sulphur per ton— 8.3 grains SO_2 per lb.

It will again be observed that the variation in results is not nearly so great in hessian house (*b*) as in (*a*).

4. Time of Exposure.

Other factors kept constant, the longer the time of exposure in the sulphur house, the greater the amount of residual sulphur dioxide in the apricots. In airtight houses this is probably by far the most important factor to be considered. The following experiments illustrate the influence of time of exposure:—

Airtight sulphur house.
Weight of sulphur per ton fruit—8 lb.
Exposed 4 hours—11.9 grains SO_2 per lb.
Exposed 6 hours—14.1 grains SO_2 per lb.
Exposed 15 hours—22.5 grains SO_2 per lb.

5. Amount of Moisture on Cut Surface.

It naturally follows that the greater the amount of moisture on the cut surface the greater the absorption by the moisture of sulphur dioxide, and the greater the amount of residual sulphur dioxide in the fruit. In the following experiment, one tray of apricots was sprayed with water just prior to sulphuring, while the next tray was not treated:—

Sulphur per ton fruit—3½ lb.
Exposure—6 hours (day).
Sulphur dioxide—
Sprayed fruit—15.0 grains per lb.
Unsprayed fruit—10.6 grains per lb.

In another experiment, the tray first pitted and that pitted last were placed together in the stack and sulphured, with these results:—

Sulphur per ton fruit—8 lb.
Exposure—14½ hours (night).
Sulphur dioxide—
Tray first pitted—10.2 grains per lb.
Tray last pitted—9.2 grains per lb.

To get uniform results, it would appear to be necessary to ensure that all fruit in the house has a uniform amount of surface moisture. If a considerable time has elapsed between commencement and finish of pitting a batch, it may be advisable to spray the fruit with water before sulphuring. But the fruit at the bottom of the stack (i.e., that first pitted) is for a while in a more concentrated atmosphere of sulphur dioxide than that at the top (last pitted), and experiments have shown that the bottom tray has a tendency to absorb more sulphur dioxide than the top tray, so that the lower moisture content of the first pitted tray would tend to counterbalance the effect of its being the bottom tray in the stack.

6. Temperature.

The temperature inside the sulphur house (which is largely governed by external temperatures) has an effect on the absorption of sulphur dioxide. As has already been shown, at night the exposure must be considerably longer than during the day to achieve the same result.

Variations of temperature from day to day will have some small effect, and a certain allowance should be made for such variations. The maximum day temperature during these experiments was fairly uniform at about 90° F.

Conclusions.

From the number of factors that affect the results it is not possible to lay down absolutely hard-and-fast rules for sulphuring apricots, but the following recommendations regarding amount of sulphur, time of exposure, &c., may be taken as the maxima for apricots picked "eating ripe" and sulphured under normal temperature conditions.

Type (*a*) Sulphur House.

Day sulphuring—
7 lb. sulphur per ton fruit.
5 hours' exposure.

Night sulphuring—
5 lb. sulphur per ton fruit.
12 hours' exposure.

Type (*b*) Sulphur House.

As the results obtained depend to such a large degree on the permeability of the particular house, definite recommendations cannot be made. Eight lb. sulphur per ton of fruit, with from 4 to 5 hours' exposure during the day, and the same amount of sulphur, with from 12 to 14 hours' exposure at night, should not leave an excess of sulphur dioxide in the fruit.

A canvas house is naturally susceptible to winds, and the greater the velocity of the wind the greater the loss of sulphur dioxide through the covering. It is thus somewhat difficult to control sulphuring and to get consistent results with this type of house, so that, although less latitude may be possible, type (*a*) sulphur houses are to be preferred to those of type (*b*).

These recommendations represent the maximum times of exposure and weights of sulphur in ordinary commercial sulphuring to produce dried apricots within the standard. If it is possible to obtain a satisfactory dried product with less sulphur or shorter exposures, so much the better. The weight of fruit in a charge should be calculated by weighing the quantity (unpitted) necessary to fill two or three trays, and thus obtaining the average per tray. Calculate the amount of sulphur necessary per charge, weigh this, and measure the volume in a container. Hereafter it would be sufficiently accurate to measure out the same volume of sulphur each time, provided number of trays, &c., are kept constant.

It is often stated that sulphuring is complete when the pit cavities are nearly full of juice, but excessive sulphur dioxide may result unless the trays are removed *immediately* the cups are about half full of juice. To judge this point, a glass view-window is required in the sulphur house. If the skins easily come away from the flesh, this also is an indication that sulphuring is finished.

Care should be taken to see that the sulphur is burnt in such a manner that the fumes are distributed evenly through the house. Thus it is better to burn half the sulphur at each end rather than all the sulphur at one end of the house. Trays should be staggered alternately about 6 inches at the ends to facilitate the passage of fumes through the stack. As soon as pitting is completed, the stack should be placed in the sulphur house.

Apricots are apparently by far the most difficult fruit to sulphur, in that they are most easily oversulphured, and, consequently, ruined for export trade. Every care should, therefore, be taken during this

operation to ensure a uniform product without an excess of sulphur dioxide. It may be necessary to sacrifice colour to a slight extent to ensure that the product will not be rejected on sulphur dioxide content.

The recommendations given will serve to guide producers, and, if followed, should ensure that dried apricots so produced will not contain an excess of sulphur dioxide. It may be possible to conduct further experiments during the coming season, which may suggest certain refinements in the sulphuring process.

A summary of some of the experiments conducted is given in the appendix.

Acknowledgment is made of the assistance rendered by many growers in the Mildura district, and by Mr. C. Wills, orchard supervisor of that area.

APPENDIX.

Table 1.—Type (*a*) Sulphur House (airtight).

Cubical Contents of House.	Weight of Charge Green Fruit.	Sulphur Burnt.	Sulphur per Ton Green Fruit.	Sulphur per 100 cub. ft. of House.	Exposure Hours.	SO_2 Grains per Pound.	Remarks.
cub. ft.	lb.	lb.	lb.	lb.			
225 ..	875	3	7¾	1·33	12 (night)	23·4	*
91 ..	665	2½	8½	2·75	15 ,,	22·5	*
91 ..	665	1½	5	1·65	20 ,,	20·3	
91 ..	665	1½	5	1·65	13 ,,	14·0	
225 ..	900	3	7½	1·33	12 ,,	19·7	*
91 ..	665	2	6¾	2·20	4 (day)	11·7	
91 ..	665	2¼	7	2·47	6 ,,	14·1	
91 ..	665	1	3½	1·15	6 ,,	10·6	

* Existing practice at various orchards.

Table 2.—Type (*b*) Sulphur House (permeable).

Cubical Contents of House.	Weight of Charge Green Fruit.	Sulphur Burnt.	Sulphur per Ton Green Fruit.	Sulphur per 100 cub. ft. of House.	Exposure Hours.	SO_2 Grains per Pound.	Remarks.
cub. ft.	lb.	lb.	lb.	lb.			
237 ..	830	3	8	1·27	14½ (night)	10·2	*
112 ..	700	1	3½	0·89	14 ,,	10·1	*
68 ..	625	4	14	5·89	10 ,,	7·9	*
68 ..	625	4	14	5·89	4¾ (day)	10·1	(very permeable) *
112 ..	700	1¾	5½	1·56	4 ,,	8·3	(very permeable) *

* Existing practice at various orchards.

THE APPLE INDUSTRY.

By J. M. Ward, Superintendent of Horticulture.

The Beginning of the Fruit Industry in Australia.

So far as can be gathered the earliest apple trees grown in the Commonwealth were planted in Tasmania about 100 years ago. These were planted at a place called York Town on the West Tamar, Northern Tasmania. The old trees—or at least some of them—are still there, and considering that they have been neglected for probably a quarter of a century, are remarkably healthy.

The young trees no doubt were imported from England and, according to statements made at various times, the planting of them was initiated by Lady Franklin, wife of Sir John Franklin, the then Governor of Tasmania.

Some years after this, small commercial orchards were established in the southern portion of Tasmania, chiefly in the Huon districts, and in the vicinity of Hobart.

At that time practically the only apple varieties known there were English kinds. These for the most part were Mobb's Codlin, Ribstone Pippin, Stone Pippin, French Crab, Emperor Alexandra, Sturmer Pippin, Alfriston, some of the Russets and a few other kinds. At a later period other English varieties were introduced.

From 1870 to 1880, and later, a considerable number of commercial apple orchards were planted out along the banks of the Derwent and the Huon. Many of these orchards are still in existence, and are as vigorous and productive to-day as they were 30 or 40 years ago; some of them in the Huon district are producing up to 1,200 bushels per acre. About the time commercial orchards were planted in Tasmania, or a little later, apple orchards were planted in Victoria.

The Beginning of the Export of Apples from Australia.

So far as can be ascertained, Tasmania was the first State in the Commonwealth—and probably the first country in the Southern Hemisphere—to export apples to England. Commercial shipments commenced about the year 1888, and a year later consignments were sent from Victoria. It is on record that as far back as 1875 Victoria sent a few bushels of fresh fruit overseas, but the kind of fruit and its destination are not mentioned. During 1876, 3 bushels were shipped from Victoria to Mauritius, and 80 cases to the East; while in 1880, 13 bushels were sent to the United Kingdom.

Since the commencement of commercial shipments to England, Tasmania and Victoria have sent apples to the Old Country every year. A start was made with a few thousand cases, and with the exception of the war period, shipments gradually increased until last year 3,242,950 cases were exported to England and Europe from Australia.

The Australian apple industry undoubtedly owes a great deal to the old Tasmanian and Victorian apple-growers. In the early apple shipping days, no encouragement was given by the Government to growers to export their fruit; they had to depend upon their own resources in establishing apple shipments to Great Britain, and take the necessary risk of losing money. So much for a brief look into the past.

The Present Condition of the Industry.

To-day growers are, of course, more interested in the present and future of the apple industry than in its past history. Profiting from the experience of early growers, it was found that certain American-raised varieties—Jonathan in particular—were looked upon by English and Australian buyers with more favour than were English kinds, and attention has been given by nurserymen and fruit-growers to the raising and planting of such American varieties as Jonathan, Delicious, and Rome Beauty, together with the Australian-raised apples, Dunn's, Granny Smith, Crofton, Tasma (also known as Democrat), Stewart's, and others.

Instead of planting a great number of varieties in, say, a 10 or 20-acre orchard, the present-day planter confines himself to a selection of four, or at most, six kinds for one orchard. For the purpose of obtaining interpollination, he spreads his varieties throughout the area, that is, he rarely plants more than four rows of any one variety in one block. This is followed up by two or four rows of another kind that blossoms at the same period. Through lack of knowledge of the subject, the early grower planted his varieties in blocks of perhaps ten or twenty rows.

Whilst our early growers had their worries and troubles in the production of the apple, I am of the considered opinion that the present-day grower has still more problems. For instance, he has more competition to meet in the world's markets; he has more pests and diseases to fight; the cost of production is about 100 per cent. higher than it was ten or fifteen years ago, and the price obtained for the apples is not commensurate with the increased cost of production and living expenses. He has also to pay greater attention to providing the tree with plant food, while freight and all necessary requisites are higher in price.

In short, to-day's grower, in order to provide himself with to-day's living requirements, really has to produce three cases of apples against one case produced fifteen years ago. This is not being done, hence our apple-growers' worries. Orchards producing less than 300 cases per acre are not profitable to the owner. All growers of apples in any district having less than 300 cases per acre should get together, and perhaps, in conjunction with departmental officers, endeavour to find some means by which the production per tree can be increased, or to consider methods by which the cost of production and marketing can be reduced. With proper organization many fruit-growers' problems could be solved, but our present organization is not fitted to do this.

Those having orchards on a poor class of soil that will not allow of the trees making sufficient growth to produce, say, three to four cases per tree at 20 feet apart should give consideration to closer planting, say, 18 feet, or in extreme cases, even 16 feet apart. The writer is not an advocate of such close planting, but there are areas in which the poor class of soil does not permit of anything but dwarf trees. In such instances a greater quantity of trees could be planted to each acre with advantage, and thus increase the production per acre, with very little increase in cost.

Orchardists with trees large enough to produce three to four cases or more, but which are not doing so, should endeavour to discover the cause. It may be due to insufficient plant food, lack of interpollination, or unskilful pruning and cultural methods. The following information may be of interest to our apple-growers and exporters:—

During the past five years, that is, 1921-22 to 1925-26 seasons, 1,825,099 cases of apples were exported from Victoria to oversea markets, but chiefly to the United Kingdom. The average price paid for these apples f.o.b. Melbourne was 7s. per case (some were sent on consignment), totalling £638,784 13s.; the average price obtained per case overseas would be not more than 10s., a total of £912,549 10s. But the cost of placing the fruit on the market plus the 7s. paid for the fruit in Melbourne was approximately 12s. per case, totalling £1,095,059 for the quantity shipped, thus showing a loss of £182,510 on the total shipments— a clear proof that whilst the export of apples may be profitable to some, there are growers or exporters, or both, who are showing a loss on exports. Those interested should be alive to these facts, and make every endeavour to adjust matters so that a profit can be made for all concerned. Undoubtedly the present export situation is not satisfactory, and a change is needed.

Practically all growers who export retain from 50 per cent. to 75 per cent. of their crop for disposal on the Australian market, where the average price received is more profitable to them than are the English prices; growers are therefore able to carry on.

I am optimistic in regard to the future, but that optimism is conditional on the adoption of improved methods in both production and marketing, particularly the latter.

The Department of Agriculture is gradually strengthening the horticultural staff with scientifically trained officers, and I have every reason to consider that with the improved service we expect to give fruit producers, better methods will be adopted in the future, thus benefiting both the growers and the State as a whole.

The keynote of future success is organization; not merely the organizations that we have at present, where the orchardists pay a few shillings per annum to the local association, but organization that will be run on commercial lines, so that the central body is such that it will have not only a permanent secretary, but will employ also a smart business man as manager, in charge of a first class staff to sell the production in the best markets, at a minimum of cost with a maximum of efficiency, and also supply the growers' requisites at the lowest possible figure.

PASSION FRUIT CULTURE.

By J. Farrell, Orchard Supervisor.

The cultivation of the passion vine (*Passiflora edulis*) for its fruit may be regarded as a relatively new section of the fruit-growing industry of Australia. On account of its beautiful flowers it was at one time employed mostly as a decorative climbing plant in parks and private gardens. During recent years, however, the public has developed a liking for passion fruit, and now many acres of vines are under cultivation in the different States of the Commonwealth.

The passion vine is a native of Brazil, and consequently likes a fairly warm situation, but it is, nevertheless, capable of adapting itself to a comparatively wide range of climatic conditions, and will make good growth and yield heavy crops of fruit except where severe frosts occur. Individual vines fruit well in and around Melbourne; in fact, they thrive in most parts of Victoria. The localities where passion fruit is grown commercially include Seville, Wandin, Silvan, Mount Dandenong, and parts of Gippsland. Elevated land or gentle slopes make the best sites for passion plots, for the vines abhor low-lying, wet and sour soil conditions, and in such situations frosts do them considerable damage.

The history of the development of passion fruit culture in Victoria may be briefly stated as follows:—

The late Mr. C. T. Briggs, a pioneer fruit-grower of Wandin, commenced growing this fruit commercially in 1892, and in that year he planted half an acre of vines, that area being increased to 5 acres a few years later. Other local fruit-growers followed Mr. Briggs's example by planting small plots of passion vines, after which the growing of this fruit was taken up by growers in neighbouring localities.

At first difficulty was experienced in selling the fruit, and often as low a price as 3s. or 4s. per bushel case was accepted for it, but as the public liking for it developed prices went up to 10s., 13s., and 20s. per case, and in seasons when crops were light as much as 30s. to 40s. per case has been obtained for very early and some late lots. The average selling price for the last five years has been about 15s. per bushel case. There appears to be a good demand in England and America for the fruit pulp, and the future of the industry here will largely depend upon the export of our surplus to those countries. In fact, owing mostly to our inability to supply America's demand for pulp, the cultivation of passion fruit is about to be commenced in the United States, and seed has been supplied by Victoria for this purpose.

Situation.

In selecting a site for a passion plot, a gentle slope to the north or north-east should be chosen; the surface should be of rich, friable soil with a subsoil sufficiently porous to afford perfect natural drainage. The passion plant thrives best in a warm, humid atmosphere, and being an evergreen it makes some growth here during mild winters.

The vine likes shelter, and will not thrive in cold wind-swept situations. It prefers undulating localities, and it is there that it is mostly cultivated. Adjacent hills often intercept prevailing winds, and where such protection is not available suitable breakwinds should be provided. These may be had by retaining belts of native timber, or by planting rows of pinus insignis, eucalypts or other suitable shelter trees.

A Passion Vine showing both Fruit and Flowers.

Because of its comparatively recent introduction to the ranks of the commercial fruits grown here, our knowledge of the passion's likes and dislikes of the different classes of soil is somewhat limited. It seems to thrive best in a rich, fairly moist soil, provided this is well drained. In the hilly country where passions are mostly grown the soil dries out sometimes during warm weather, but as the rainfall is fairly heavy in these parts sufficient capillary moisture is maintained by intensive and continuous cultural treatment of the soil during summer.

Raising Young Plants.

The young plants grow freely from seed; this should be taken only from the best quality fruits. The seed may be sown about the end of September in seed beds or in drills, and covered with 1 inch of fine soil.

The best plants are grown in the open air, but sometimes the seedlings are raised under cover. They make from 12 to 18 inches of growth during the first year, and their stems are kept single, that is, free from side shoots, to a height of from 4 to 6 inches above the ground level. The matter of growing the seedlings is a comparatively simple one, and the nursery bed should be near the plot where it is intended to plant out the vines permanently. When lifting these with the spade the roots and soil around them should be kept intact and placed in the holes made to receive them. One-year old seedlings should be planted out in early spring, when the frosts are over. Passion vines grow best on virgin soil, but whatever the conditions in this regard may be the soil should be thoroughly cultivated prior to planting.

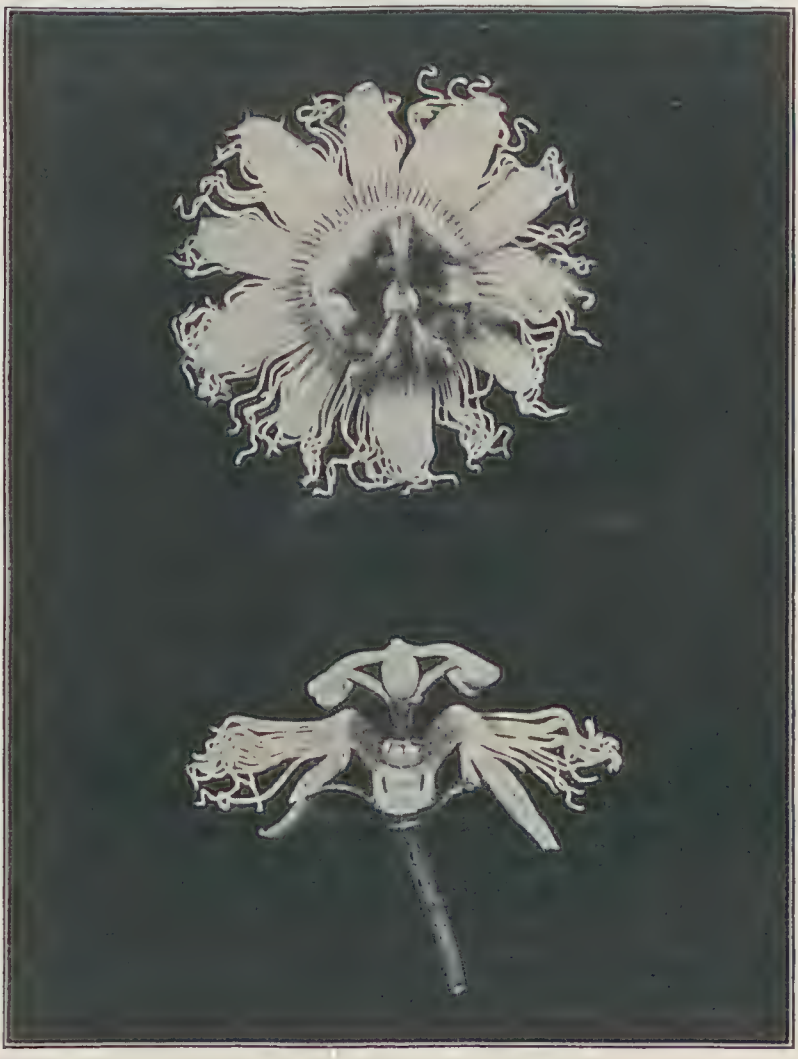
Planting Out the Young Vines.

During the early years of passion fruit culture there was great diversity of opinion among growers as to the most suitable distance apart at which to plant the vines. However, it is now generally recognized that 18 feet by 12 feet apart gives the best results, that is, 18 feet between the vines in the rows, which are 12 feet apart. Post and wire trellises about 5 feet high are erected to support the vines which are trained to grow in fan shape on the wires. The trellises, as already stated, are 12 feet apart, and run with the rows of plants which they support. The posts for the trellises are usually rough split timber about 6 inches in diameter, and three to five wires of 8 to 10 gauge are employed. The young passions when properly cared for make good growth, and are large enough to be tied to the wires the first year after planting. The desired symmetrical appearance and future stability of the vine's superstructure largely depends on how it is treated at the tying up, and this part of the work should be done in a systematic manner.

The young leaders of the vine are made to radiate from the stem in fan shape, and then each one is tied to the wires as high up as it will reach. The passion, like the grape vine, produces tendrils, which during their development, cling to the wires and offer further support to the plant. Wooden droppers and vertical wires are sometimes used to afford further support to the vines and to strengthen the espalier, as a vibrating trellis is not conducive to the growth of the passions. As the passions are planted 18 feet apart and the trellis is 5 feet high, 216 square feet of trellis is allotted to each vine, and with good cultivation and careful management each plant will cover its portion of trellis in four years from the time of planting.

The land between the trellises should be ploughed at least twice a year and further cultivated with spring-tooth harrows as often as necessary to maintain a fine tilth and conserve moisture. The passion

is a gross feeder, and responds well to good cultural treatment and manuring. From the time of planting commercial fertilizers should be used to enable the plants to quickly establish themselves and maintain growth. Bonedust and superphosphate may be applied with



The Flower of the Passion Vine.

advantage. Each annual dressing should consist of at least 4 lb. to the vine, and of equal parts of bone and superphosphate; this is harrowed in after ploughing during early spring. More liberal dressings could with advantage be given when the plants are carrying heavy crops.

The vines commence to bear at two years old, when a few cases per acre are gathered. The yield is usually better during the third and fourth years, and when five or six years old the plants are in full bearing, usually producing on an average one case of fruit each per year.

When planted 18 feet by 12 feet as previously mentioned, there are approximately 200 vines to the acre, and at a yield of one case of fruit, each valued at an average of 15s. per case, they would give a gross return of £150 per acre. Of course, like other branches of fruit-growing, passion culture has its ups and downs. Severe frosts and fungus (*Gloeosporium*) are the troubles mostly met with.

Pruning.

Pruning during the first three or four years consists mainly of regulating and directing the leading shoots, which afterwards produce

Showing the Development of the Passion Fruit.

numerous superfluous light lateral growths. If these are not removed their subsequent maintenance causes the vine to become somewhat devitalized, and consequently more easily defoliated by fungus diseases and frosts, particularly when cultivation is neglected. And if the debilitated willowy growths appearing after the vine is six years old are not removed the feeding roots become sluggish, and eventually cease functioning. Now, pruning must be regarded as a prime factor in the culture of passion fruit. Most other kinds of fruit-bearing plants that make early vigorous growth rarely come into bearing as early as those showing weak or normal development. This, however, does not apply in the case of the passion vine; on the contrary, vigorous growing young plants show the desired precocity, and continue to bear better and more consistently than the less robust or weakly ones, and the fruit is usually larger and of better quality.

When a vine is of prolific character, and growth commences in the spring, a high percentage of blooms appears, but many of those do not set fruit. The blooms and tendrils are produced in pairs, one

flower and a clasper appearing in each leaf axil; occasionally one or both may be missing. These blossoms and tendrils develop during the currency of the growth of the yearling wood, and they rarely appear until the leader or lateral growth, as the case may be, has extended beyond the fourth or fifth node or bud from its base on the older wood. Although the leaders produce fruit when young, the side laterals are generally more prolific croppers.

Weather conditions being favorable, the first blossoms begin to appear about the end of November; fruit from these ripens in March and April; the fruit from blooms showing about that time mostly ripens during June and July. In some localities and during certain seasons, however, cropping is almost continuous from February to July or even August.

The superfluous willowy growths and their foliage serve as a protection for the limbs and buds during winter, consequently pruning operations should not be commenced until the frosts are over. When pruning is not practised the vine's superstructure becomes too dense, and light and air are excluded, resulting in the fruit being small and of inferior quality. About two-thirds of the light lateral growths should be removed during pruning. Some growers use a long hook-shaped knife for this purpose, others employ ordinary secateurs—with these pruning is a slower process—but the growths may be cut back more accurately and neatly to the desired nodes and bases.

The passion, like the grape vine (Vitis) produces its fruit on the succulent laterals developed during the currency of the season's growth, and these laterals come from leaf-buds on the previous year's wood. Growers with a knowledge of the pruning requirements of the grape vine quickly learn how to prune the passion.

Provided the weather conditions at the time of early blossoming be favorable a large number of flowers is produced, and a high percentage of these sets fruit, but when the growing conditions at this time are unfavorable a light crop is usually the result. There is at times, however, evidence of self-sterility, as large numbers of blossoms fail to set even in fine weather, notwithstanding the fact that the flower is so constructed as to ensure perfect pollination. The young fruit is at first of a light green colour, changing to dark purple when ripe, and is consequently known by the growers as the black passion. The fruit, on arriving at the mature stage, should be picked off and marketed as soon as possible; if not, it commences to wilt, drops to the ground, and deteriorates in value. Although the contents of wilted fruit are the more palatable, retailers prefer to stock passion fruit before this condition is reached; once wilting commences it proceeds rapidly. When the demand is slow, the fruit often shrivels before it can be distributed, consequently higher prices are obtained by growers for fresh fruit.

CHICKEN REARING.

By W. C. Rugg, Chief Poultry Expert.

Nothing is more necessary for success in poultry farming than a knowledge of the best methods of rearing chickens. This applies particularly to the man who is engaged in producing eggs for market.

Laying hens can be compared to most classes of fast-running machinery, which if kept continuously in operation have a comparatively short life. The owner must replace them frequently, or go out of business. Most poultrymen find it necessary to replace 25 to 75 per cent. of their flocks each year. For this reason, on most farms, chicken rearing has to be carried out annually, to a greater or lesser degree.

There is an old saying, and a very true one, that "A chicken well hatched is half reared." The chicken well hatched is the chicken that arrives on time, that is, on the evening of the 20th day of incubation or on the morning of the 21st, which leaves the shell clean, and in an hour is a beautiful ball of fluff. In a little while it should be bright and active and ready to pick at anything and everything within reach, from the fractured walls of its late residence to the glass panel in the front of the incubator.

To get chickens of this description, we must breed from vigorous parents, of strong constitution, which are in the right condition to breed from when the eggs are laid. This is a matter of supreme importance, yet some poultrymen do not give it any consideration at all. They seem to think that so long as a chick hatches out, it should be as good as any other chicken. Nothing is further from the truth.

It is a well-known fact amongst experienced breeders that the best and strongest chickens are always bred from the first 20 to 30 eggs laid by a hen directly after she moults. During her moult the hen ceases to lay, and her reproductive organs have a complete rest. When she comes into lay again, she is in the best physical condition to produce eggs that contain strong germs. These, if incubated under proper conditions, will produce strong livable chicks, which in turn, if brooded in clean, sanitary quarters, supplied with a variety of nourishing foods, and given as much exercise as possible on fresh, clean ground, will develop into efficient machines for the converting of grain, &c., into that highly-nutritious commercial product—new-laid eggs.

To get pullets that will show the greatest profits, the chicks should be hatched during the months of July, August, and September. As a general rule, chickens hatched after this are not so strong; they take longer to mature and, with regard to pullets, generally lay smaller eggs.

The Birds from which to Breed.

If poultry farmers would select their breeders from hens that have been hatched early, they would be surprised at the increase in size of their stock in a year or two, and in the size of the eggs laid by them. If a poultryman is to have a successful chicken season he must be prepared to cull, and to cull hard. Starting with the breeding stock, he

should cull out all birds that are not healthy and vigorous, and of standard size for the breed. Remember that in Utility Breeds the danger of small eggs increases with every ounce the birds are under the standard weight for the breed. All birds that have not moulted should be put out of the breeding pen until they have grown their new feathers. The breeder should cull out also birds that have moulted too early—that is November and December—since these are likely to reproduce early moulters, which are not profitable.

Birds that have moulted in the late autumn and commenced to lay at the end of June and the beginning of July are the kind required in the breeding pen. Next, the eggs that have been saved for the incubators should be culled. All that are uneven in shape, poor in texture of shell, under 2 oz. in weight, abnormally large, or dirty in shell, should be kept out of the incubators. Then again, culling should be done at hatching time. Any chick that is not good and strong when hatched should be destroyed. Weaklings should never be allowed to reach the brooders; they are a menace to the rest, and will only occupy space that is needed for the strong, healthy ones. Finally, culling should be done right through the rearing period, any chicken that is slow in developing, or showing signs of weakness of any kind, being disposed of at once.

It is surprising to find so many poultrymen who will cull out a weak or slow-growing cockerel without the slightest hesitation, yet will not destroy a miserable weak pullet. Apparently they console themselves with the thought that, because it is a pullet, some day it will lay eggs and perhaps pay for its keep. This is a dangerous mistake. These weak pullets should be culled just as ruthlessly as the weak cockerels, for they may become a danger to the whole flock. They are usually the first to contract disease, or catch cold; frequently they develop catarrh, which often ends in an outbreak of chicken-pox or perhaps roup, leading to a falling off in the egg production of the flock just at the time of high prices. All these entail a heavy financial loss and a decrease in the general health and vitality of the whole flock.

Experienced breeders are fully aware of this danger, but people with little experience often start the breeding season with the idea of rearing a stated number of pullets of any sort, so long as they are pullets. The sooner they realize that it is the quality of the stock they rear, and not the number, that decides their profit the better it will be for themselves and Victoria's poultry industry.

It is very probable that, in the near future, prices for poultry products will be lower. Poultrymen must make every effort to meet this position by rigid culling. By so doing they will improve the quality of their stock, and increase their production. If this be followed up by better marketing methods, local consumption will be considerably stimulated.

Care of the Young Chick.

From the time the eggs start to chip, it is a good plan to hang a curtain in front of the incubator to exclude the light. Most incubators have a glass door in the front, and the first chickens to hatch will scramble over the top of any eggs between them and the light. If some

of these eggs have just chipped, and the eggs get turned over with the chipped side down, there is a great danger of the chickens being smothered before they can struggle out.

I do not believe in allowing chickens to drop down into the nursery tray until the hatch is over. In a great many machines the difference in the temperature on the egg tray and that in the nursery tray about 3 inches below is too great, and the baby chicks that fall down there before they are thoroughly dry often get a chill, which is a bad start in life.

It is far better not to open the door of the incubator after the evening of the 18th day until the hatch is over on the night of the twenty-first day or morning of the twenty-second. Then the chicks can be toe-punched, and put into the nursery tray, to remain there for 24 hours before they are removed to the brooder.

Some poultrymen declare that this is waste time, as they want to get the machine filled up again. That can be overcome by having warm, well-ventilated boxes into which to put the chicks. Day-old chick despatch boxes, if lined with straw, will do, providing they are kept in the incubator room. Whatever is done, it should be remembered that chickens require at least 24 hours' complete rest after hatching. In my opinion, this is the very best start they can be given. Warmth and rest is all they want. By adopting this method, there will not be any danger of their being fed too soon, so that the yolk gets a chance of being absorbed. When they are taken to the brooders, they bounce out strong, and ready for what the new world has to offer in the way of food.

The correct temperature of the brooder is a matter of opinion. I am sure more chickens are killed each year by too much heat rather than by too little. I have been most successful with a temperature in the brooder of 85 degrees in cold weather, and not lower than 80 degrees, that is, on the litter on the floor of the brooder when it is empty. If, the chicks are watched closely, their behaviour is the safest guide. If, when resting, they are nicely spread out, you can be sure the temperature is right, but it is well to remember that chicks will crowd or huddle when too hot as well as when too cold.

One of the chief reasons for failure in rearing chicks in brooders is bad ventilation. It should be recollected that the respiration of chickens is much faster than in man. As the chickens have no sweat glands, much of the liquid intake is given off through their respiratory organs, so the air exhaled from the lungs is heavily charged with moisture. This accounts for the high humidity found in badly ventilated brooders, and is often the cause of chickens crowding together, and sometimes smothering. These chickens are generally referred to as sweated. To obviate this danger, it is necessary to ensure good ventilation without draughts, and the constant circulation of air to eliminate moisture.

The next most important thing to remember with chickens is that they require no feed for from 48 to 56 hours after they are hatched. Many thousands of chickens die each year from faulty feeding, and a great many through being fed before the crop and gizzard are prepared to receive food. I find the best thing to give when they are from 48 to 56 hours old is a little coarse sand and fine charcoal. The grains of sand pass through to the tiny gizzard, which is then ready to help in the

grinding of the food as it passes through from the crop. The charcoal helps to purify any gases that may have accumulated, and so puts the chick's digestive organs into good working order.

I believe in putting about 1 per cent. powdered charcoal into all chick foods for the first two or three weeks. After that, if granulated charcoal is made available to them, they will eat as much as they require. Judging by samples of foods I have examined, many of the special chick feeds on the market are entirely unsuitable. Some of them contain seeds that it is impossible for small chickens to digest. Fortunately, we have in Melbourne a few firms who specialize in poultry foods, from whom good, safe chicken foods can be obtained. Many people mix their own, and I find the plainer the mixture the better.

The sooner chickens can be got out on the ground the better, and if the weather is too bad, it is a good plan to cut a sod of grass and place it in the brooder run every day; chickens, even at three or four days old, get valuable exercise picking at the green shoots, and probably find many minute insects not seen by us, but which are very beneficial to them. Milk in some shape or form should be supplied to chicks from the time they are first fed. Separated milk is good. Where this is not available, dried buttermilk or dried skim milk can be purchased. Milk fed to chickens may be either sweet or sour, but it should always be given in the same condition. If fed sour one day and sweet the next, bowel troubles are likely to occur. Cod liver oil is recommended by some, but if chicks have plenty of sunlight, constant supplies of succulent green stuff, and plain, wholesome food, I doubt whether any benefit will be derived. In countries where the climate is not so good as ours, and where green stuff is hard to get, cod liver oil may be used to advantage. In too large quantities, however, it is likely to interfere with digestion.

Chickens should be continually shifted on to fresh ground, and even where the space is limited, much can be accomplished in this direction by using temporary hurdles, and not allowing the chickens to run over the whole area.

Minced raw onions can be given once a week from the time chicks are a week old. I know of no better tonic. I believe in having a plain, dry mash always before the growing pullets, and giving them a wet mash as well. With this method of feeding their crops will be extended as much as possible. If this is not done when they are young, they will not be able to consume sufficient food to enable them to produce large numbers of eggs.

Cockerels should be separated from the pullets as soon as they can be identified. This will give the pullets more room. Pullets should be placed in their permanent laying quarters at about sixteen weeks old. If left till they start laying, they may resent the change, and go into a false moult.

To summarize, it may be pointed out that success in chicken raising depends, firstly, on sound breeding stock; secondly, on correct incubation and brooding; and, thirdly, on plain, wholesome food, plenty of direct sunlight, and clean ground.

HYGIENE IN THE POULTRY YARD.

By H. F. Clinton, Assistant Poultry Expert.

Poultry hygiene is a very important factor for consideration if permanent success is to be looked for by the poultry keeper. It is of far more value to understand what good hygiene means than to possess any number of isolated and more or less correct ideas as to the treatment of sick stock. The cure of sick birds is not always possible and rarely profitable, since recovered birds seldom regain the vigor which they formerly possessed. Too many people, however, instead of informing themselves concerning sanitary measures, wait until their flocks become diseased, and then try to combat the disease. A surer and less expensive means is to surround the flock with healthful conditions, which will go far towards preventing disease.

In poultry keeping many may be successful for a time in defying the laws of sanitation and hygiene; in fact, a very few may be successful for quite a long time; but in the long run the majority will find that thorough, careful, and intelligent attention to these laws will be one of the best guarantees of permanent success that they can find. Whenever stock are kept under more or less confined and artificial conditions, the question of good hygiene becomes one of the first importance.

Infection may be brought on to the poultry farm on the clothing and boots of persons coming from infected farms; and vehicles, crates, utensils, or anything used for the conveyance of birds may also act as a medium for the introduction of disease. Infection can be conveyed from one part of the farm to another in the same way. Another method by which infection may occur is by the introduction of diseased stock. It might be thought that this could easily be prevented, but such is not the case. Every infectious disease has what is known as a period of incubation, that is to say, a more or less definite time elapses in each disease from the entry of the organism into the body till the appearance of the first symptoms indicating that the animal is diseased, and it may happen that stock are purchased and moved on to a farm in that period.

Again, there are many diseases which may develop in either acute or chronic form, and birds affected chronically will often show very little sign of the disease, or may be no sign at all, especially if the conditions under which they are living are good as regards feed and general hygiene. Later, when adverse conditions occur, the disease may again become active. In one or two diseases the existence of carriers (that is, birds which are affected and infectious to others, but which at no time show signs of disease) is more than probable. Further, it is not usual for the purchaser to know sufficient of the symptoms of various diseases to be able to say whether birds are affected or not, and owing, therefore, to one factor or another, a diseased bird may slip in.

Both external and internal parasites at times lead to severe disease and mortality among poultry. Poultry Ticks, by inoculating birds with an organism, produce a disease known as Tick Fever. By constantly irritating a bird, red mite, lice, worms, and other parasites lower its

vitality, and disease finds an easy victim. Dust baths, spraying, and certain general measures of good management go far in preventing infestation by these pests.

The Poultry House.

A very considerable proportion of disease and mortality can be more or less directly traced to errors in the selection of the site for the poultry farm, and in the construction of buildings in which the birds are to be housed all or part of their time. The structures should not be placed on low-lying swampy ground or on ground likely to be flooded. Birds living under damp and cold conditions are likely to become affected with colds, roup, chicken pox, rheumatism, &c., and they would also have to expend so much of the energy derived from their food in maintaining bodily warmth, that they would not thrive.

The buildings should be located on a rise of the ground where drainage is away from instead of towards its foundations. No moisture should come through the floor, or else it will be difficult to keep the litter dry, as it must always be if health is to be preserved. The floor should be at least 6 inches higher than the surrounding ground. A properly laid cement or brick floor is safe, sanitary, and permanent. Floors should always be well covered with from 4 to 6 inches of dry and clean litter, otherwise they will be cold and uncomfortable. This will also enable the brids to have plenty of exercise. Houses for adult fowls should be open fronted and face the east, and the south-west and north walls should be wind-proof. If open to the east the early morning sun will shine right into the house, and help to keep the air pure and sweet. It will also help to keep vermin in check, for they thrive in dark badly ventilated houses.

Over-crowding must be avoided, and if fowls are to be kept on the intensive system, 4 square feet of floor space should be allowed for each bird. The house should be high enough to allow of good ventilation, and to enable cleaning, &c., to be done in comfort. It should be not less than 7 ft. 6 in. high in front and 6 feet at the back, and deep enough (about 15 feet) to allow the birds to roost well away from the front of the house so that they will be out of draughts as much as possible. About 8 inches of perch-room should be provided for each bird. Perches should be 15 inches apart, all on one level, and not more than 2 ft. 6in. from the floor. If a manure pit is provided at the back of the house under the perches, the life of the scratching litter will be prolonged.

Ventilation should be provided for by a 6-inch opening, with a hinged board, the full length of the house at the back close to the roof. This allows a current of air to pass through, and is high enough above the birds to prevent draughts; in addition, it will help to keep the roof cool even in the hottest weather. Lack of ventilation prevents moisture laden air which soon accumulates within a laying house from moving out, and when it finally cools and falls, the condensed drops of moisture settle upon the litter, thus rendering the house unsafe for the further habitation of healthy stock.

All fixtures, perches, &c., should be movable to enable cleaning and disinfection to be thoroughly and quickly done.

The provision of clean nests is very important, in order to guard against the eggs from becoming soiled. Washing an egg makes it dirtier, because when the natural coating or bloom is removed, it allows disease-producing organisms to penetrate through the pores of the shell. It is well known that washed eggs do not keep well when preserved or when placed in cool store. Shell grit has been found to be a good material to place in the nest boxes in order to keep the eggs clean. At the State Research Farm, Werribee, it has also been observed that nests provided with shell grit are always free of vermin.

Care in Feeding.

It should be a rule never to feed any food which is not clean, sound, and wholesome. Mouldy, sour, or decomposing foods should never be fed. Regularity in feeding and suitable foods make for disease-resisting strength. Foods should be stored in vermin-proof receptacles. Undoubtedly, the best results are obtained by feeding fresh succulent green stuff. A regular supply of grit and charcoal should always be available for the birds.

The most rapid method by which infectious diseases of all kinds are transmitted through a flock of birds is by means of the drinking water. Therefore, a constant supply of fresh and clean water should always be at hand.

Selection and Mating of Breeding Stock.

Great care in the selection and mating of the breeding stock is necessary if the resulting progeny are to have a high degree of constitutional vigor and the power to resist disease. Once a bird has ever been sick, it should never be used in the breeding pen.

In view of the fact that a disease known as Bacillary White Diarrhoea is prevalent in Victoria, it would also be advisable to have blood tests made of the breeding stock. This disease attacks chicks within four or five days after hatching. A few may recover, and though they may grow into good strong birds, unfortunately they rarely get rid of the infection. Usually they retain some of the casual microbes in their ovaries, and, when the birds produce eggs, those eggs contain the microbe. If the eggs be fertile, the chicks from them will be infected, and so the disease can be transmitted from one generation to another. Further particulars of this disease are contained in an article on the subject by Professor Woodruff, which appeared in this *Journal* for October, 1926.

Guarding Against Disease.

There is still a very great deal to be learned in connexion with the control and prevention of poultry diseases. The poultry industry has reached large enough proportions to warrant at least one investigator spending his whole time on the subject. The staff at the Melbourne University Veterinary Institute, under the direction of Professor Woodruff, has already done splendid work in investigating poultry diseases. This institution is always glad to be acquainted with any information concerning poultry troubles, so that the chain of evidence may be strengthened.

When stock are purchased, some provision should be made, apart from the runs and pens, in which the birds can be kept, until the purchaser is reasonably satisfied that they are healthy.

Sick and dead birds are a menace to the flock. It has been frequently observed that some poultry-keepers take a sick bird from amongst the flock and allow it to roam anywhere about the farm. This is a bad practice. Sick birds should be isolated immediately, and if they do not respond readily to treatment, should be killed. Whenever possible every dead bird should be burned (not buried) just as soon as death has occurred. If it is buried, one never knows when, by the means of dogs, worms, insects, &c., the disease may be brought to the surface.

Cleaning the Poultry House.

All buildings or structures of whatever kind in which poultry are housed any part of their lives should be subjected to the most thorough cleaning and disinfection every year. The first thing to do is to remove all the litter and loose dirt. Then give the house (floors, walls, and ceiling) a thorough sweeping, and shovel out the accumulated debris. If a good water service is available, play a garden hose, with the maximum water pressure which can be obtained, upon floor, perches, walls, and ceiling, until all the dirt which washes down easily, is disposed of. Next take a scraper and scrape clean all caked dirt and shovel it out. Then once more get the hose into action and give the whole place a second washing, to be followed by a second scraping. With a stiff broom thoroughly scrub everything, and after another rinsing down and cleaning up of all refuse, let the house dry out for a day or two.

Everything now appearing to be clean, the time has arrived for making it really clean by disinfection. To do this, it is necessary to spray all parts of the house with a good disinfectant. There are many good commercial preparations that will serve the purpose. The chief thing is to use an effective disinfectant, and plenty of it.

Before the incubator season commences, incubators, brooders, and brooder houses, should also be thoroughly cleaned and disinfected.

On farms, where automatic water systems have been installed, the pipes should be cleaned out with a good suction pump or flushed through with the aid of pressure from the water supply. It is an advantage to pass a hot soda solution through the pipes, as this helps to remove any decomposing filth. A suction pump similar to that used for pumping water out of gas pipes has been found to be useful for this class of work.

How often the general cleaning requires to be done throughout the year depends on the system under which the birds are kept. In some cases the droppings should be removed daily. Under other conditions a regular cleaning once a week would suffice. In any circumstances, a good general clean-up should be carried out every three months. Food and water, vessels and systems should be cleaned and disinfected regularly.

A very important operation is the control of red mite. Although not hard to kill, great difficulty is often experienced in getting at their hiding places, so that sheds and perches should be as free from cracks and crevices as possible. The perches can be painted with tar to fill up any cracks, and the jointings treated at intervals with

kerosene or tar oil. During spraying operations special attention should be given to all wood-work around where the birds roost.

For the treatment of lice on the birds the dust bath should always be kept in order. Individual birds that are badly infested with body vermin may be dusted with a good insect powder. Tainted ground is responsible for many of the diseases from which birds suffer. When many fowls are run continuously on the same land, the ground often becomes contaminated. Plowing and sowing a crop will overcome this difficulty and also ensure a sweet soil.

Conclusion.

In conclusion, it may be said that the essentials in the hygiene and sanitary management of poultry are—

Clean Houses:
Clean Air:
Clean Food:
Clean Water:
Clean Yards and Clean Range:
Clean Incubators and Brooders:
Clean Birds, outside and inside.

AN APPRECIATION OF DEPARTMENTAL ADVICE.

In writing to Mr. R. T. Archer, Senior Dairy Inspector of the Department of Agriculture, to express appreciation of a wireless talk on the Pig Industry, Mr. W. H. Miller, of Millbrook, adds:—

"I feel deeply indebted to you and other officers of the Department for setting me on the right track when I commenced pig-breeding operations two years ago.

"My herd at present consists of five pure-bred Middle York sows, two Berkshire sows, and one pure Large York boar.

"My pigs have been selling exceptionally well at Ballarat, and when not topping the market have been within a few shillings of the top. This is in competition with pigs much older. Both auctioneer and buyers have congratulated me on the quality and type of the pigs."

"ARRAN" POTATO VARIETIES.

Replying to a recent correspondent, the potato expert, Mr. J. T. Ramsay, gave the following explanation of the origin of the name "Arran" used as a prefix in certain varieties of potatoes. The whole of these "Arran" varieties, he pointed out, were propagated by a Mr. McKelvie, of Lamlash, Isle of Arran, Scotland. Mr. McKelvie has been very successful in potato cultivation, and has made a name for himself as a propagator of new varieties. Unfortunately, although Arran Chief is one of the best croppers he has produced, it is not immune from Black Wart (*Synchytrium endobioticum*).

FERTILIZERS FOR POTATOES.

DEPARTMENT'S EXPERIMENTS 1926–27.

By J. T. Ramsay, Potato Expert.

CHILDERS.

(Mr. F. Mayo's Farm.)

The potato experimental plots at the above centre were continued last season with excellent results. The standard manurial variation decided on four seasons ago was again applied. The season was one of the driest on record, and this, of course, reduced the yields. Nevertheless, the very satisfactory tonnage of 8 tons 8 cwt. per acre of market-sized tubers was harvested from the heaviest yielding plot.

As has been the case now for four years, the dressing of 6 cwt. superphosphate and 1 cwt. of ammonium sulphate per acre proved to be most suitable and profitable. In the accompanying table showing the figures of tonnages harvested from the various manures, there is shown the increase due to manure, the cost of the manure, the increased value, and the net increased value per acre. In computing these values, £5 per ton has been taken as being a moderate estimate of the value of potatoes up to the present time, viz., 30th July.

An interesting column in the table is that giving the cost per ton increase of the various manures. When harvesting was being done for the purpose of determining acreage tonnages, four separate areas on each of the manurial variations were harvested, and the average of these four only is given. The object of harvesting four separate areas is to eliminate as far as possible any margin for error due to variations in soil in the field.

In addition to the figures taken from the actual plots themselves, an average of the farmer's own crop outside the experimental area, but on the same class of soil, was taken from ten different lots. As will be seen from the table, the farmers' lots and the experimental plot No. 1, both of which have the same manuring, come out with only the slight difference of 2½ cwt. to the acre yield, which is insignificant.

The figures for this season accentuate the advisability of a liberal application of manure to this class of country, which is a good red-loam soil. The marked increase from 3 tons 9½ cwt. harvested from the unmanured plot to 8 tons 8¾ cwt. harvested from the plot which had an application of 6 cwt. of superphosphates and 1 cwt. of ammonium sulphate shows what a substantial extra profit there is to be gained by a liberal and judicious manuring. It is significant that where superphosphate was applied at a rate above 6 cwt. to the acre, as in plot No. 3, which had 9 cwt., there is not only no increase in the crop, but an actual depression of the yield. These figures support very strongly results obtained during the last four years on this class of soil.

In addition to the manurial trial, spacing tests were also carried out, and the results of these are shown in the table. Though there is not an enormous difference in the tonnages yielded from the closer spacings, the results show the advisability of close spacing. Had the

season been a normal one in the matter of rainfall, the difference between those tonnages would have been much more marked.

Since four years' figures are now available, it is possible to give an average of the four years, thus countering differences in results due to seasonal variation.

Notwithstanding the fact that, on analysis, this soil appears to be high in nitrogen content, low in phosphoric acid, and low in potash, the manure giving the best result is a combination of phosphatic and nitrogenous fertilizers. Although potash appears to be deficient, the application of a potassic manure gave no increase in yield.

Results of Manurial Trials, Childers.

(Soil—Chocolate Loam.)

Manure per acre.	Yield.	Increase due to Manure.	Cost of Manure.	Cost per ton Increase.	Increased Value per Acre.	Net Increased Value per Acre.
	T. c. q.	T. c. q.	£ s. d.	£ s. d.	£ s. d.	£ s. d.
3 cwt. super. ..	5 15 0 (5 12 2)	2 5 2	0 18 9	0 8 4	11 7 6	10 8 9
6 cwt. super. ..	6 10 0 (6 5 3)	3 0 2	1 17 6	0 12 6	15 2 6	13 5 0
9 cwt. super. ..	6 6 1 (6 4 1)	2 16 3	2 16 3	1 0 0	14 3 9	11 7 6
6 cwt. super., 1 cwt. pot. sulph. ..	6 10 2 (6 4 3)	3 1 0	2 13 0	0 17 9	15 5 0	12 12 0
No manure ..	3 9 2 (2 17 1)	..	..	..	..	..
6 cwt. super., 1 cwt. ammon. sulph. ..	8 8 3 (7 5 3)	4 19 1	2 15 0	0 11 0	24 16 3	22 1 3
6 cwt. super., 1 cwt. ammon. sulph., 1 cwt. pot. sulph. ..	6 16 1 (6 18 0)	3 6 3	3 10 6	1 0 10	16 13 9	13 3 3
3 cwt. market garden	5 16 1 (5 11 2)	2 6 3	1 8 6	0 12 2	11 13 9	10 5 3
3 cwt. basic phosphate ..	5 15 2 (5 15 1)	2 6 0	0 18 9	0 8 1	11 10 0	10 11 3

Note.—The average yields over the past four years are shown in brackets.

Average of ten lots from the farmer's own crop, outside the experimental area, but on the same class of soil, and manured with 3 cwt. of superphosphate per acre—5 tons 17 cwt. 2 qr.

Seed Spacing Test.

Spacing—	T. c. q.
Rows 27 inches apart, sets 12 inches apart ..	7 18 0
„ 27 „ „ 16 „ ..	7 10 1
„ 27 „ „ 20 „ ..	7 9 3
„ 30 „ „ 12 „ ..	7 18 2
„ 30 „ „ 16 „ ..	7 8 1
„ 30 „ „ 20 „ ..	6 14 2

ROMSEY.

In conjunction with the Romsey and West Bourke Agricultural Society, the Department last year undertook the conduct of experimental plots on the farm of Messrs. Spring Bros., Romsey.

The class of country is a red clay loam of good quality, and typical of a large area in the district. The season was exceptionally dry, and this, of course, had the dual effect of restricting considerably the yield of all crops in the district, and also somewhat nullifying the action of the manures applied on the experimental plots.

These plots were planted in duplicate, an area of 2 acres being utilized for the nine manurial variations. In spite of the adverse season, appreciable percentage increases were obtained, particularly with superphosphate, ammonium sulphate, and market-garden manure. Details of the results are given in the accompanying table, which also shows the relative cash increases from the various manures.

In addition to the manure trials, a cultivation test was carried out. Although the extra cultivation produced an increase of barely half a ton, the test indicated that benefit can be derived by increasing the number of inter-cultivations given the crop during the growing period.

It is intended to continue these trials at Romsey for some years, and it is anticipated that much more striking results will be obtained in a season when the rainfall is normal and sufficient for the crop's requirements.

Results of Manurial Trials, Romsey.

(Soil Type—Red Clay Loam.)

Weights given are the average of Four Lots.

Manure per acre.	Yield.	Increase due to Manure.	Cost of Manure.	Cost per ton Increase.	Increased Value per Acre.	Net Increased Value per Acre.
	T. c. q.	T. c. q.	£ s. d.	£ s. d.	£ s. d.	£ s. d.
3 cwt. super. ..	3 13 0	0 10 1	0 18 9	1 17 6	2 11 3	0 13 9
6 cwt. super. ..	4 3 3	1 1 0	1 17 6	1 15 8	5 5 0	3 9 4
9 cwt. super. ..	4 2 3	1 0 0	2 16 3	2 16 3	5 0 0	2 3 9
6 cwt. super., 1 cwt. pot. sulph. ..	3 13 3	0 11 0	2 13 0	4 16 4	2 15 0	0 2 0
No manure ..	3 2 3	..	..	..	..	..
6 cwt. super., 1 cwt. ammon. sulph. ..	4 7 2	1 4 3	2 15 0	2 4 5	6 3 9	3 8 9
6 cwt. super., 1 cwt. ammon. sulph., 1 cwt. pot. sulph. ..	3 19 0	0 16 1	3 10 6	2 16 4	4 1 3	0 10 9
3 cwt. market garden manure ..	4 6 2	1 3 3	1 8 6	4 4 7	5 18 9	4 0 3
3 cwt. basic super. ..	3 16 2	0 13 3	0 18 9	1 7 3	3 8 9	2 10 0

Cultivation Test.

	T. c. q.
One cultivation	4 12 2
Two cultivations	5 1 1

WARRAGUL.

As a result of the application of the Warragul Agricultural Society, the Department instituted potato trials in that centre last seaon. The analysis of the Warragul soil on the farm of Mr. S. Adkins, where the tests were carried out, shows that it is fairly well supplied in nitrogen and potash, but deficient in phosphoric acid. Notwithstanding the fact that it has a fair quota of potash, this is one of the few places showing appreciable increase in the crop as the result of the application of potassic manure. The heaviest yield was obtained from a dressing of 6 cwt. of superphosphate and 1 cwt. of potassium sulphate per acre, which gave the remarkable increase of 8 tons 1 cwt. 1 qr. per acre above the no-manure plot. The next highest was plot No. 7—a complete manure, also containing potassium sulphate—which gave 14 tons per acre, or an increase of 7 tons 1 cwt. 1 qr. over the no-manure.

The effect of potassic manure on this particular soil is surprising, inasmuch as few of the potato soils in the State show any response to this form of artificial fertilizer.

In computing the values, £5 per ton has been taken as a fair price for the season, and only the market-sized tubers have been taken into consideration. The season at Warragul was slightly below average in rainfall during the summer, but sufficient late rains eventuated to enable the crop to develop the fairly heavy tonnage recorded.

An interesting feature of the figures is the low cost per ton increase, which ranges from 3s. 3d. to 10s. per ton. Exceptionally good net increases in value are shown, pride of place in this being taken by the dressing of 6 cwt. of superphosphate and 1 cwt. of sulphate of potash, which, after paying for the manure, gave a net acreage increased value over the no-manure crop of £37 13s. 3d.

Results of Manurial Trials, Warragul.

(Soil—Clay Loam.)

Weights given are the average of Four Lots.

Manure per acre.	Yield.	Increase due to Manure.	Cost of Manure.	Cost per ton Increase.	Increased Value per Acre.	Net Increased Value per Acre.
	T. c. q.	T. c. q.	£ s. d.	£ s. d.	£ s. d.	£ s. d.
3 cwt. super. ..	12 15 0	5 16 1	0 18 9	0 3 3	29 1 3	28 2 6
6 cwt. super. ..	12 15 0	5 16 1	1 17 6	0 6 6	29 1 3	27 3 9
9 cwt. super. ..	13 0 0	6 1 1	2 16 3	0 9 3	30 6 3	27 10 0
6 cwt. super., 1 cwt. pot. sulph. ..	15 0 0	8 1 1	2 13 0	0 6 7	40 6 3	37 13 3
No manure ..	6 18 3	..	..	..	..	..
6 cwt. super., 1 cwt. ammon. sulph. ..	13 7 2	6 8 3	2 15 0	0 8 6	32 3 9	29 8 9
6 cwt. super., 1 cwt. ammon. sulph., 1 cwt. sulph. pot. ..	14 0 0	7 1 1	3 10 6	0 10 0	35 6 3	31 15 9
3 cwt. market garden manure ..	11 2 2	4 3 3	1 8 6	0 5 0	20 18 9	19 10 3
3 cwt. basic super. ..	10 12 2	3 13 3	0 18 9	0 5 0	18 8 9	17 10 0

CATANI.

The class of soil on which the tests at Catani have been carried out for the past four years is swamp peat, which analyses very high in nitrogen, high in phosphoric acid, and fairly good as far as potash is concerned. Notwithstanding this, the results obtained during the four years under consideration have consistently shown that it is essential, for the best results to be obtained from this class of soil, for a fertilizer containing nitrogen to be applied. For some unknown reason, cut seed on the swamp country this year missed very badly, and that accounts for the low yields obtained from all the manurial variations which were planted with cut seed. The misses ranged from 35 to 40 per cent. throughout the plots, whereas in the case of the test of Millbrook as against Catani seed, the Millbrook whole seed gave only 5 per cent. of misses. This accounts for the great disparity apparent between the yields from Millbrook seed as against Catani seed. Another factor influencing this change of seed test was the fact that the Millbrook seed had been subjected to a degree of selection for some years past, whereas the Catani seed had not had that advantage. There is not the slightest doubt that had Catani seed had the same treatment in the matter of selection, and whole seed planted instead of cut, there would have been but little difference in the performance of both.

There is an impression prevalent amongst growers on the swamp that it is necessary to change seed once every two or three years, but this has not been substantiated by any practical demonstration. The difference this year in favour of seed brought from an outside district is entirely explained by the two factors already mentioned, viz., whole as against cut seed, and selected as against unselected seed.

The results of the manures obtained this year at Catani were considerably affected by the percentage of misses occurring in the crop, but they show the advantage of the application of artificial fertilizers to this class of soil. Curiously enough, although the Catani soil analyses high in lime, it is one of the very few instances where any benefit is derived from the application of lime to the potato crop.

Reference to the accompanying table setting out the yields obtained from limed as against unlimed areas shows a constant increase in favour of lime throughout the plots, though the increase is small. The average increase due to the application of lime at 1 ton per acre works out this season at the rate of 9 cwt. 1 q. per acre. Including cost of freight, cartage, and application, lime on the average farm cannot be applied to soil at a less cost than somewhere about £2 10s. per acre, and since this year's figures are worked out on a crop value of £5 per ton, it will be seen that no pecuniary benefit at this rate accrues from the use of lime. The application of lime for the potato crop on soils of a different character to those at Catani shows, over a period of years, a depressing effect on the crop.

Results of Manurial Trials, Catani (Gippsland).

Class of Soil—Swamp Peat. On the farm of Mr. E. Cleversley.

Unlimed Section.

Manure per acre.	Yield.			Increase due to Manure.			Cost of Manure.			Cost per ton Increase.			Increased Value per Acre.			Net Increase per Acre.			Per-centage Increase.
	T.	c.	q.	T.	c.	q.	£	*s.*	*d.*	£	*s.*	*d.*	£	*s.*	*d.*	£	*s.*	*d.*	%
3 cwt. super. ..	2	5	1	1	1	1	0	18	9	0	17	10	5	6	3	4	7	6	87
6 cwt. super. ..	2	8	0	1	4	0	1	17	6	1	13	3	6	0	0	4	2	6	100
9 cwt. super. ..	2	8	0	1	4	0	2	16	3	2	6	9	6	0	0	3	3	8	100
6 cwt. super., 1 cwt. pot. sulph. ..	2	6	3	1	2	3	2	13	0	2	4	0	5	13	9	3	0	9	96
No manure ..	1	4	0	..			..			..			..			..			..
6 cwt. super., 1 cwt. ammon. sulph. ..	2	11	0	1	7	0	2	15	0	1	2	6	6	15	0	4	0	0	112
6 cwt. super., 1 cwt. pot. sulph., 1 cwt. ammon. sulph. ..	2	12	1	1	8	1	3	10	6	2	10	4	7	1	3	3	10	9	116
3 cwt. market garden	2	13	2	1	9	2	1	8	6	0	19	0	7	7	6	5	19	0	120
3 cwt. basic phosphate ..	2	2	2	0	18	2	0	18	9	1	0	3	4	12	6	3	13	9	75

Limed Section.

Manure per Acre.	Yield.			Increase due to Lime.		
	T.	c.	q.	T.	c.	q.
3 cwt. super.	2	9	0	0	3	3
6 cwt. super.	2	14	3	0	6	3
9 cwt. super.	3	9	2	1	1	2
6 cwt. super., 1 cwt. pot. sulph.	2	14	3	0	8	0
No manure	1	5	2	0	1	2
6 cwt. super., 1 cwt. ammon. sulph.	3	4	2	0	13	2
6 cwt. super., 1 cwt. pot. sulph., 1 cwt. ammon. sulph. ..	3	9	2	0	17	1
3 cwt. market garden	3	1	1	0	7	3
3 cwt. basic phosphate	2	4	2	0	2	0

Whole Seed *versus* Cut Seed.

T.	c.	q.		T.	c.	q.
4	3	0		2	16	0

Change of Seed Test.

	T.	c.	q.
Millbrook seed	4	5	2
Catani seed	2	18	3

The rainfall during the season was much below average. From 1st January to 30th April only 442 points fell, which was far below the needs of the district, and was a definite factor in producing low yields.

It is now possible to give the average performance for four years of the various manurial dressings given in the accompanying table. These are as follow:—

Average Returns for Four Years at Catani from Various Manures.

—	Plot 1.	Plot 2.	Plot 3.	Plot 4.	Plot 5.	Plot 6.	Plot 7.	Plot 8.	Plot 9.
	T. c. q.	T. c. q.	T. c. q.	T. c. q.	T. c. q.	T. c. q.	T. c. q.	T. c. q.	T. c. q.
Average yield ..	5 6 2	5 18 3	6 16 2	5 13 2	3 4 0	7 15 2	8 0 1	5 6 1	6 4 1
Average increase	2 2 2	2 14 3	3 12 2	2 9 2	..	4 11 2	4 16 1	1 2 1	3 0 1
Average percentage increase ..	65%	85%	112%	76%	..	142%	150%	34%	93%

It will be seen from these figures that the manures giving the highest results at Catani are dressings Nos. 6 and 7, which are respectively 6 cwt. superphosphate and 1 cwt. ammonium sulphate per acre, and 6 cwt. superphosphate, 1 cwt. ammonium sulphate, and 1 cwt. potassium sulphate per acre. The dressing containing ammonium sulphate in conjunction with superphosphate, on actual figures, shows a slightly increased profit as compared with the dressing with potassium sulphate added, but both of these dressings are outstanding in their influence on crops grown in this class of soil.

The percentage increases are large, and the great need for the application of manures on this class of soil, although it analyses well and looks rich, is strongly emphasized by the low average yield obtained from the no-manure plots over the past four seasons.

TRENTHAM.

During the 1926-27 season manurial trials with potatoes at Trentham, on the farm of Mr. E. Brodie, were continued, and the figures obtained, which are given in the attached table, support the findings of previous seasons. The maximum yield and the greatest cash increase was obtained from the dressing of 6 cwt. superphosphate and 1 cwt. of ammonium sulphate per acre. These manures were applied together in the furrow with the seed at the time of planting.

It would appear from results obtained, not only at this centre, but at practically all centres where potato manurial trials are conducted, that this particular dressing is the most suitable one for the potato crop in practically every district in Victoria where the crop is grown. Until a few years ago it was commonly believed by farmers on the red volcanic belt in the central highlands that the application of manure to that class of soil was not only unnecessary but unprofitable. During the past six or seven years, over which period the Department of Agriculture has conducted manurial trials at Millbrook and Trentham, both red volcanic areas, the figures obtained have demonstrated amply the beneficial effect that artificial fertilizers have on the crops in these districts.

It is noticeable, however, that there seems to be a limit up to which superphosphate can be profitably applied. With regard to these districts this limit is reached at about 3 cwt. per acre. It is just possible that if a dressing of 3 cwt. superphosphate and 1 cwt. ammonium sulphate were given, instead of 6 cwt. of superphosphate and 1 cwt. of ammonium sulphate, that yields as good would be obtained, and, of course, a greater profit shown. It is intended in next year's manuring scheme to test this out on the plots situated on red volcanic soils.

Appended to the table showing this year's results of the manures at Trentham is the average performance during the past four seasons, commencing 1923-24, of each of the nine manurial variations. From this it will be seen that the optimum result has been obtained from the dressing referred to above, while the moderate dressing of 3 cwt. superphosphate to the acre runs this very closely, thereby giving point to the belief that a combination of 3 cwt. of superphosphate and 1 cwt. of ammonium sulphate would probably prove the most profitable application of artificial fertilizer to this class of soil.

Results of Manurial Trials, Trentham.

(Soil—Red Volcanic Loam.)

Weights given are the average of Four Lots.

Manure per acre.	Yield.	Increase due to Manure.	Cost of Manure.	Cost per ton Increase.	Increased Value per acre.	Net Increased Value per acre.
	T. c. q.	T. c. q.	£ s. d.	£ s. d.	£ s. d.	£ s. d.
3 cwt. super. ..	3 6 3	1 9 3	0 18 9	0 12 6	7 8 9	6 9 0
	(5 19 3)					
6 cwt. super. ..	3 5 0	1 8 0	1 17 6	1 6 9	7 0 0	5 2 6
	(6 0 0)					
9 cwt. super. ..	3 3 1	1 6 1	2 16 3	2 3 0	6 11 3	3 15 0
	(5 14 2)					
6 cwt. super., 1 cwt. pot. sulph. ..	3 3 3	1 6 3	2 13 0	1 19 3	6 13 9	4 0 9
	(5 14 2)					
No manure ..	1 17 0	..	..	..	..	..
	(2 13 2)					
6 cwt. super., 1 cwt. ammon. sulph. ..	4 10 1	2 13 1	2 15 0	1 0 10	13 6 3	10 11 3
	(6 8 3)					
6 cwt. super., 1 cwt. pot. sulph., 1 cwt. ammon. sulph. ..	3 19 2	2 2 2	3 10 6	3 4 1	10 12 6	7 2 0
	(6 3 2)					
3 cwt. market garden manure ..	2 12 1	0 15 1	1 8 6	1 18 0	3 16 3	2 7 9
	(4 18 0)					
3 cwt. basic phosphate	2 8 2	0 11 1	0 18 9	1 14 1	2 16 3	1 17 6
	(4 14 0)					

Average of ten farmers' lots manured with 1½ cwt. super. broadcast equals 2 tons 5 cwt. 2 qrs.

The average for past four seasons are shown in brackets.

LAMB MARKING.

PRECAUTIONS THAT SHOULD BE TAKEN.

By R. N. Wardle, B.V.Sc., Veterinary Officer.

The question of lamb marking and of the precautions to be taken to ensure the successful carrying out of that operation is one deserving the serious consideration of all sheep breeders. That adequate precautions are not always taken is evidenced by the large percentages of lambs so frequently lost after marking. It is the object of this article to set out a few hints that, if carried out, should reduce materially the loss of lambs from this cause.

Much of the success of sheep-farming depends on the percentage of lambs reared, and an 85 per cent. drop has much of the gilt taken off when reduced to, say, 70 per cent. after marking.

Lamb marking consists of three operations, ear-marking, castration and docking, which are performed in that order. In this article, however, it is proposed to deal only with castration and docking.

Age and Time for Marking.

Strong lambs can be safely marked any time after they are a few days old, but when dealing with numbers a good time is when the majority are about two or three weeks of age.

A period of mild weather should be chosen. Windy days, on the other hand, are most unsuitable especially if the wind be cold and piercing. Marking operations should never be carried out during hot weather. Even in mild weather it is best to carry out the work in the morning and early afternoon only. By finishing up early there is a better prospect of all the lambs being mothered before evening. This in itself will save many a lamb that would otherwise die.

Where the Work Should be Done.

Temporary pens and yards, erected out in the paddocks where the lambs are actually living form the ideal site. These may be constructed simply by the use of hurdles, stout stakes and wire netting. Temporary yards for small flocks can be constructed with surprisingly little trouble, and even when dealing with large numbers it pays to mark the lambs in temporary yards though in such cases they necessarily have to be more complicated.

The yards should be dismantled when the job is finished and in the following season a fresh piece of ground should be selected for the site.

A plan of yards to hold about 250 ewes and their lambs is reproduced in the accompanying sketch.

The advantages of using such a site are many and will bear much consideration. The lambs will not be hot and fatigued before or after the operations. This is important since fatigue lowers the resistance of the animal body to climatic changes and bacterial or germ infections.

Again, they will be placed on clean grass land instead of on broken up ground, soiled by manure, such as is found around old yards; consequently, the risk of contamination of the wounds is practically nil. A third advantage previously mentioned is that if the work is completed early in the afternoon, the ewes and lambs being in a paddock they know, will find each other more readily.

If, however, it is necessary to use the permanent yards some preparations are needed to make them as clean as possible. All manure and rubbish should be carted away to a safe place and the yards watered to lay the dust. The place of operation should be selected so that, if possible, the lambs may be dropped into a grass paddock and not into a yard. The posts and rails adjacent to the operating site should be cleaned up with an adze.

Wherever the operation is performed a new board such as a 6-in. flooring board should be nailed on to the top rail and used instead of the rail itself. A sheep skin or other covering is quite unnecessary and dangerous.

The board should be kept clean during the day by scrubbing it with a solution of washing soda in hot water, and a new board should be used each season.

The clothes not only of the operator but also of the catcher should be as clean as practicable. The lamb should be sat on the board care being taken to treat it as gently as possible. The hind legs should not be pulled too far apart, and after the operation is completed the lamb should be dropped gently on to its feet.

The Operation.

Most methods of castrating are sound enough, and in this article it is not proposed to go deeply into the *modus operandi*. One important point, however, is that the cutting off of the end of the scrotum has advantages over the practice of slitting it. In the first method any blood clot will drop out instead of acting as a medium for germs to develop.

For marking lambs late in the season, that is when they are over the average age for operating, the emasculator is preferred. This instrument severs the cord and crushes the severed end, thus preventing hæmorrhage.

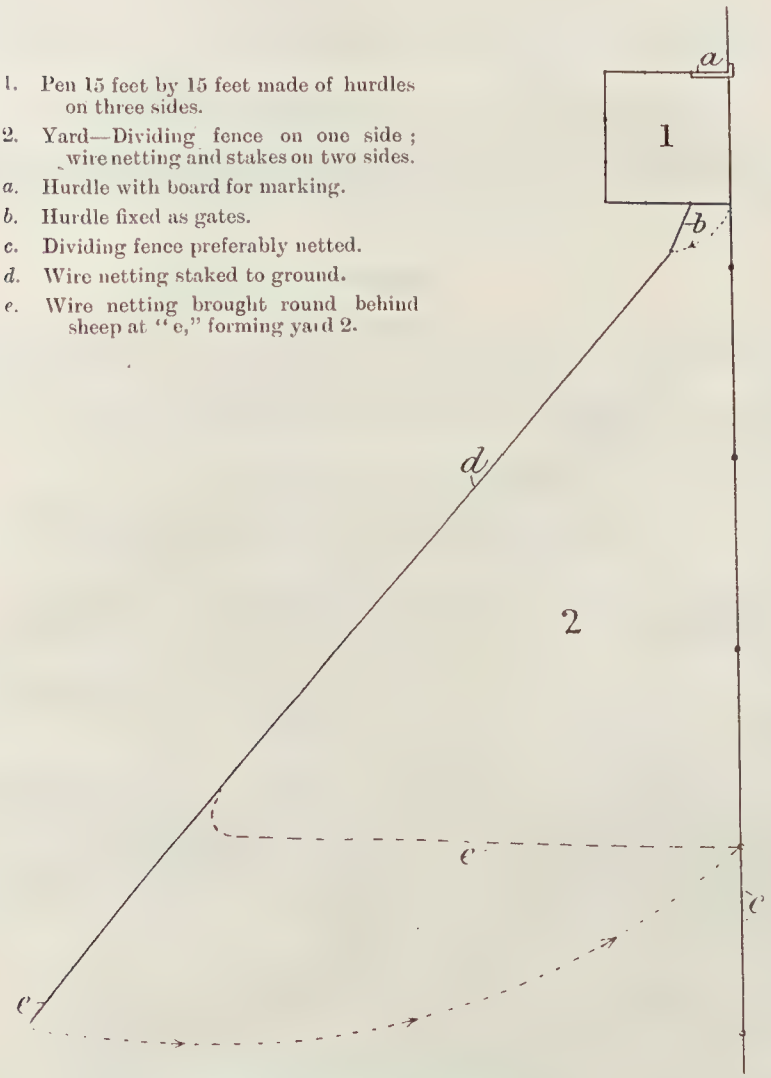
There is a method by which the male lamb can be castrated without making a wound in the scrotum. The cord is squeezed by a pair of specially constructed pincers with the result that the testicle atrophies or withers. Some flock owners who have had experience with this instrument state that lambs marked in this way thrive better than those done in the usual way, since with the former method there are no external wounds to heal, and the lamb receives less shock. In fly-infested districts or on properties known to be soiled by tetanus or by blood poisoning germs, these instruments would be invaluable.

Sterilization of Instruments.

Knives used should consist of metal wholly so that they can be effectually sterilized.

The best and surest method of sterilization of instruments is by boiling in water for fifteen minutes, and all instruments other than

knives should be so treated. Continual boiling affects the cutting edge of a knife, so with knives the practice adopted is to sharpen them, wipe clean and then soak them in and rub them over with methylated spirits.


1. Pen 15 feet by 15 feet made of hurdles on three sides.
2. Yard—Dividing fence on one side; wire netting and stakes on two sides.
a. Hurdle with board for marking.
b. Hurdle fixed as gates.
c. Dividing fence preferably netted.
d. Wire netting staked to ground.
e. Wire netting brought round behind sheep at "e," forming yard 2.
a
1
b
d
2
e
c
e

Temporary Yard for Marking Lambs.
(Will hold 250 ewes and their lambs—scale, 1 inch equals 21 feet.)

But sterilization in the first instance is of little use if, subsequently, the instruments cannot be maintained sterile. Hence, when not in actual use they should be kept in an antiseptic solution. This can be done by using a small clean and fairly flat dish (one cut out of a

petrol tin will do) arranged so that it can be fastened to a post. In this receptacle some lysol preparation of a strength of one tablespoonful to one pint of water should be kept.

The instruments should be constantly dipped in this solution and when not actually in use they should be kept in the dish. The practice of placing the instruments anywhere except in an antiseptic solution is to be strongly condemned.

If by any mischance an instrument should be soiled by dirt, the original process of sterilization must be carried out.

The operator should have water, soap, antiseptic, and a nail brush always convenient to use for washing his hands, and he should not attempt to assist at any other work.

Docking.

As regards docking the same precautions are necessary with respect to the knives used. The tail is cut off generally about the second joint. Before it is actually cut the skin should be retracted slightly towards the lamb's body by the man holding the lamb. When released it projects over the end of the bone, protecting it while healing takes place.

If the process of marking be carried out in a clean manner and the lambs placed on clean pasture after the operation dressings are superfluous. Sticky dressings that hold dust and dirt are actually harmful.

Diseases Contracted from the Infection of the Operation Wounds.

Tetanus or lockjaw is the disease causing the greatest loss in lambs as the result of wound infection. Symptoms show in from two to fourteen days after infection and are as follows:—

The lamb becomes stiff in the legs and while it can walk it shuffles along with more or less straight legs. On handling it is found that the body is also stiff and the muscles of the back and loins are hard. Later, the lamb falls down and lies in a characteristic attitude with legs outstretched and the neck drawn back. If lifted and held on its feet it is seen that the limbs remain rigid and are placed outwards from the body, the attitude simulating a trestle.

Tetanus is not a blood poisoning, but the symptoms are due to a poison affecting the nervous system.

Tetanus germs form spores or seeds, and it is the spore which contaminates the wound. These spores are extremely resistant to destruction and can live in soil and manure for a great length of time.

Losses are also brought about by blood-poisoning, and there may be several different kinds of germs causing this complaint.

Death generally occurs rapidly and the main point for notice is the fact that, like the tetanus infection, the germs of blood poisoning also inhabit manure, dust, and soil.

Summary of Precautions.

1. Clean the sheep yards before marking lambs; better still use fresh temporary yards each season.
2. Keep the marking board clean.
3. Sterilize or disinfect hands and instruments constantly.
4. Drop the lambs on to clean pasture and don't work late into the afternoon.

Some of the points that have been stressed may seem trivial, but it must be remembered that the saving of a small number of lambs each season will repay the breeder for any extra trouble that may be taken before and during the process known as lamb-marking.

FUMIGATION OF CITRUS TREES.

THREE YEARS' OPERATIONS.

By S. A. Cock, Citriculturist.

Since 1924, the Agricultural Department has been actively engaged in carrying out fumigation work: and in this article it is proposed to outline the reasons actuating the Department in undertaking this work, and to give also a short account of what has been accomplished in the past three years.

At the 1924 Citrus Growers' Conference, at which all the principal citrus districts in Victoria were represented by their association delegates, a general discussion on the subject of the control of the Red Scale showed that growers were unable to combat this pest successfully by the use of oil emulsions or other sprays. In view of this the conference unanimously asked that the Department of Agriculture should undertake the work of fumigating with hydrocyanic acid gas as a means of control. The conference further asked that, as the Red Scale was increasing to such an extent in the groves in Victoria as to become a menace to the citrus industry, the Government should make the fumigation for red and other scales compulsory.

These requests were placed before the Minister of Agriculture and acceded to. The first outfits for carrying out the work were procured for the season 1924-25, and the regulations under the Vegetation and Vine Diseases Acts were amended to cover the compulsory carrying out of the work where necessary.

It is very gratifying to note that no compulsion has been necessary for the 360 groves which have been treated up to the present time. As there appears to be some misunderstanding in relation to the compulsory clause by some growers, and exception has been taken by them to control by fumigation as against oil emulsion sprays, it

might be well to set out here the actual regulation in this regard. It is as follows:—

"All trees or plants affected by scale insects shall be sprayed with an approved scalicide or fumigated with an approved fumigant. In the case of deciduous trees these must be sprayed during the dormant season with lime sulphur, miscible oil, or an approved insecticide."

"Subsequent sprayings shall be given at intervals if deemed necessary by an inspector. In the case of citrus and evergreen trees all affected trees shall be sprayed with an approved scalicide, or fumigated with an approved fumigant, or treated otherwise as may be directed by an inspector."

The citrus supervisors controlling the fumigation are gazetted as inspectors under the Vegetation and Vine Diseases Act, and for the purpose of efficiently carrying out the work of Red Scale control, use discretionary powers as to whether fumigation or spraying is essential. It is necessary in carrying out a campaign against this pest to see that where groves are massed or adjacent to each other, there shall be, as far as possible, a complete clean up of scale, and by giving infested trees equal treatment, safeguard one grove against the other. In such cases, fumigation with hydrocyanic gas is required to be carried out. In cases where odd trees are found slightly infested, or where groves are very isolated and slightly infested, spraying with an approved scalicide is required to be carried out. Or, if trees are worthless, neglected and infected with disease, their eradication is suggested.

The supervisors are trained men, and in carrying out their duties first make a census of the infested trees. The grower is then told the number of trees requiring attention and the cost of performing the work. If he possesses an outfit, he can carry out the work himself, but it must be done to the satisfaction of the supervisor. If he elects to have the work carried out by the Government outfit, he signs an agreement for the performance of the work as between himself and the Department of Agriculture, and the work is then done under the direction of the supervisor.

For the purposes of supervising the citrus industry, the State of Victoria is divided into four districts—Mildura, Swan Hill, Shepparton, and the Southern and North Central district. The Swan Hill district embraces Nyah, Swan Hill, Tresco, and Kangaroo estates, and Murrabit, while the Shepparton district takes in Cobram, Shepparton, Wangaratta, Kyabram, and Tongala. The Southern and North Central district includes Doncaster and surrounding districts, Bamawm, Rochester, Echuca, and Stanhope.

In 1924-25 fumigation began at Cobram, and upon completion of the work in that district the outfit of 30 sheets was removed to Shepparton. In 1925-26 this outfit was engaged for the whole of the season at Shepparton. During the season 1926-27 it completed the fumigation of all Red Scale infested trees at Tongala, and when work ceased in May was operating at Kyabram. Next season it is hoped to complete the Kyabram, Merrigum, Tatura area, and begin operations again at Shepparton. The total number of trees fumigated

by this outfit for three seasons is 25,964, at an average cost of 1s. 9d. per tree.

In the Swan Hill district, in 1924-25, work began at Riverside, Gonn Crossing, and continued in 1925-26 with an outfit of 30 sheets. In 1926-27 another outfit of 30 sheets was added. This operated at Mead, Cohuna, Tresco, Swan Hill, and eventually joined the other outfit at Gonn Crossing. In three years this district has had all infested trees treated. Next season it is hoped to release 30 of these sheets for work at Echuca, Bamawm, and Stanhope, where no fumigation has been carried out so far. The total number of trees treated in the three years in the Swan Hill district is 30,410, at an average cost of 1s. 8¾d. per tree.

In the Mildura district the outfit for 1924-25 consisted of 30 sheets; this was increased by a further 30 sheets for a period of three months in 1925-26, in order to fumigate the infested trees at Merbein. This outfit was then removed to Doncaster, as the sheets, while being large enough to cover the larger trees at Merbein, would not cover the larger trees at Mildura.

In 1926-27, 30 large sheets, capable of covering the large trees, were added to the Mildura outfit. In that district almost all the infested trees have been treated once, and next season the outfit of 60 sheets will probably be fully occupied in fumigating the trees treated three years ago, which are now showing signs of re-infestation. At Mildura 28,896 trees have been fumigated, at an average cost of 3s. 0½d. per tree.

In the Doncaster district, including Ringwood and Burwood, fumigation was started at the end of the 1925-26 season, but weather conditions were unfavorable, and after 182 trees had been treated at an average cost of 2s. 9d. per tree, the outfit closed down. Work began early in the 1926-27 season, and 7,378 trees were fumigated at an average cost of 2s. 9d.

During the time fumigation has been proceeding, the Government outfits have fumigated 92,630 trees, the average cost per tree being 2s. 2¾d. From statistics recently taken, it is shown that there are approximately 900,000 citrus trees in Victoria, and as there are probably another 10,000 trees which are scale-infested and not yet fumigated for the first time, and fully 10,000 trees which are privately fumigated, it may be seen that the infestation of our groves prior to the compulsory campaign against Red Scale was approximately 14 per cent. of the planted trees.

The Department of Agriculture has spent £3,800 in equipment, which comprises 192 sheets. These sheets are of three sizes—56 feet, 45 feet, and 36 feet, and are octagonal in shape. It is estimated that a sheet will last long enough to fumigate 1,000 trees. The materials used for fumigating are cyanogas and liquid hydrocyanic acid gas. Cyanogas is used at a strength of 1 oz. by weight to every 100 cubic feet of enclosed space; and liquid hydrocyanic acid gas at a strength of five-sevenths of a fluid ounce to every 150 cubic feet of enclosed space. The latter is used chiefly for lemons, and cyanogas for oranges, mandarins, and pomelos.

Some growers frequently express doubts as to the kill of scale after fumigation. The scale insect is firmly attached to the leaf, limb, and

fruit, and although dead does not fall off for some time. Wind and rain ultimately remove the dead scale. The practical test of fumigation is the re-infection that may ensue when the hatch of the young scale take place in January and February. It is possible to obtain a kill of 100 per cent., but not usual, on account of climatic conditions which govern fumigation, also the resistance of Red Scale at certain periods of growth. At what is known as the second moult of the insect is apparently the most difficult time to procure a good kill.

In California the resistance of Red Scale to sprays and fumigation causes much concern, and Professor Quayle (an eminent authority there) recently advised, in what are known as resistant scale districts, the spraying first with an oil emulsion, followed almost immediately by fumigation. By this means a commercial kill of 97-98 per cent. is achieved. This course is not yet necessary in Victoria, as the work so far carried out has proved effective to the extent of 97 per cent. of the groves treated.

THE STORING OF LEMONS.

A FURTHER EXPERIMENT.

By Frank M. Read, M.Agr.Sc., Horticultural Division, and G. B. Tindale, B.Agr.Sc., Science Branch.

Previous Experiments in Victoria.

In May, 1926, the first-named author published in this *Journal* a description of experiments made in the Storing of Lemons in Victoria. While it is hoped that reference to that article will be made by those who are interested in this one, still the main conclusions drawn at that time are set out briefly here, for they greatly influenced the choice of conditions under which this work was carried out.

It was shown that with careful handling the grower has little to fear from blue mould, for this organism can attack only fruit whose rind has been damaged. Tipping lemons from one box to another is one of the most frequent causes of injury. The rind is greatly strengthened by "sweating" in the open boxes for a day or two before storing.

Fruit should be picked as it reaches a diameter of 2½ inches while still unripe. The riper the fruit is when picked, the less satisfactorily will it store. No fruit should be allowed to hang on the trees after it has reached the stage suggested. In practice this is best achieved by picking the trees over, say, once a month.

The Case Stated Generally.

As has been pointed out, growers are faced with the position that their main crop ripens at a time of the year when there is the least sale for lemons, and prices are often unpayable. Later in the season during the summer months the demand increases, and lemons being

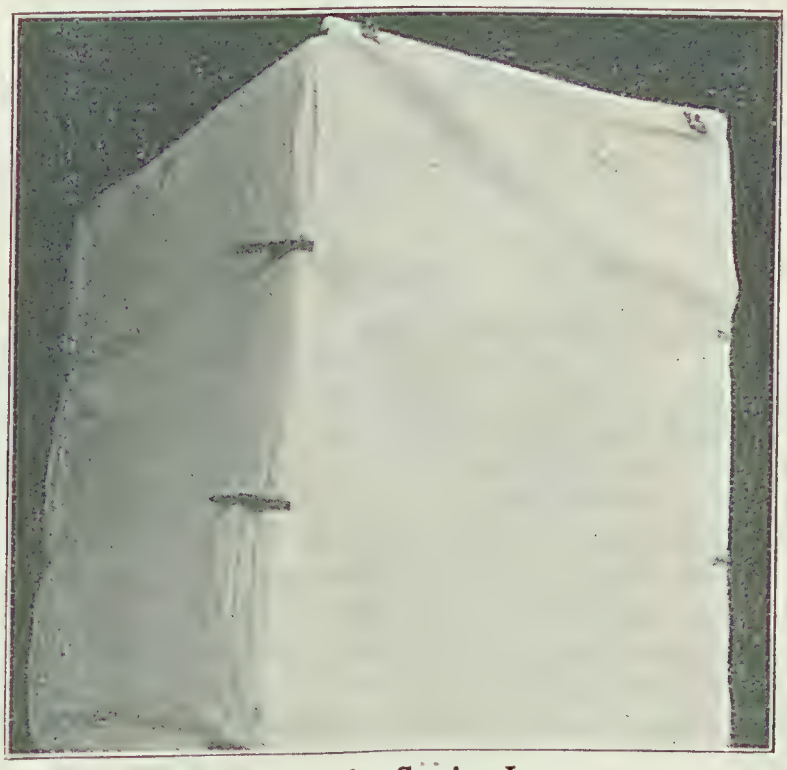
scarce, prices frequently reach very high levels. Were the grower able to store his surplus spring crop till the summer months, he would then generally find a very profitable outlet for it.

The methods tested last year were those considered suitable for the average fairly open sheds possessed by growers.

The trial to be described is suitable for good sheds reasonably free from severe draughts. It is considered very suitable for use in good packing sheds when space is available from September or October to early summer.

The Method Described.

The lemons were carefully picked from the grove of Mr. W. A. Webb, Doncaster, during the third week of October, 1926. They were then carefully but loosely placed in benzene cases lined with



Canvas Tent for Storing Lemons.

The sides, which may be rolled up, are strapped at the corners. The canvas is fitted over a hardwood frame.

newspaper, and remained in Mr. Webb's shed in a stack for a week. In this way they were sufficiently "sweated." To facilitate observation, they were then brought to Melbourne, and were placed in a disused chamber at the Government Cool Stores. The reason for storing them at the Cool Stores was simply one of convenience, and, of course, ordinary temperatures prevailed in the chamber. The stack of 36 cases was covered with a canvas tent as shown in the illustration. Inside the tent a dish of water was placed, so that, with the aid of the tent, a fairly high humidity might be maintained in order to limit to some extent evaporation from the lemons, and thus avoid excessive shrinkage. While a high humidity is essential to maintain the condition of the fruit, yet it is necessary from time to time, especially in the first weeks of storage, to raise the sides of the tent if drops of moisture are appearing on the surface of the fruit. If this free mois-

ture is not dried off moulds are more likely to form than if the rind be kept fairly dry. The sides of the tent should be dropped as soon as the free moisture has disappeared, so as to maintain a moist atmosphere inside the tent.

The tent shown in the illustration is of the best quality canvas fitted over a hardwood framework. The framework is necessary to prevent the tent collapsing progressively, as the lemons are taken out for sale from day to day. The sides of the tent are seen to be free, and may be rolled up as suggested. The sides must overlap at the corners so as to prevent ready access of air, and should be strapped together as shown. The tent may be of any size; in a large tent, however, it is advisable to leave a passageway down the center for inspectional purposes.

The canvas may be made more impervious by painting the inside surface with a solution made up of—

3 lb. paraffin,
1 gallon petrol,
1 gallon boiled linseed oil.

Heat the paraffin to melt it; mix and apply while hot. The use of this solution may prove of distinct advantage in the warmer parts of the State.

Results.

The 36 boxes of fruit were kept as described from the third week in October, 1926, to the 11th January, 1927. Ocasionally when necessary the sides of the tent were rolled up for a few hours, and the fruit was inspected from time to time for mould inspection. No lemons were attacked by the usual blue mould, but a few were infected with grey mould, *Botrytis cinerea.*

The loss in weight averaged about 4 lb. on a 40-lb. box of fruit for the period of storage, and at the end of the test on the 11th January the lemons were packed into 27 cases. Although they had shrunken slightly they were in fine condition. The shrinkage took place at the expense of the rind, which became thin and leathery. The pulp increased in juiciness, and when squeezed practically no rag remained.

The fruit was sold through the usual channels on the day that the test concluded. The following prices were obtained:—

7 cases AA quality, £1 per case	£7
20 cases A quality, 18s. per case	18
Total return	£25

At the time the fruit was bought in October no more than 7s. per case could be obtained in the Melbourne markets. Thus at that time the 36 cases were worth only £12 12s., so the margin of profit was considerable.

The experiment paid for itself amply, even including the whole cost of the apparatus, which should not, of course, be wholly charged to the first year's operations, since the tent will last for many years.

It is suggested that growers study these figures, and also work out the cost of putting the method into operation in their own groves. Where a suitable storing shed is available, the margin of profit would certainly be substantial.

THE CAUSES OF DETERIORATION IN MILK.

HOW THEY MAY BE OVERCOME.

By J. M. Kerr, Chief Dairy Supervisor.

Milk is the most valuable of all human foods, since it contains all the essential food elements in a readily digestible form. At the same time it is the most easily contaminated of all foodstuffs. Delicately constituted as milk is, it is an easy matter to get it to the consumer in an ideally sound condition, when the consumer happens to be a calf sucking it from the udder, as nature intended. But when we come to use it for human purposes at a place more or less remote from the source of production, certain factors of contamination enter, which milk was never designed by nature to resist.

These factors are increased contact and increased time—contact, because touching most things means making contact with germs; and time, because germs do damage mainly by virtue of numbers, and even germs require some time to multiply. There is practically no serious cause of milk deterioration other than germs; but the germs must be actually in the milk, and they must be there in sufficient numbers to cause serious deterioration.

Provided the cow is healthy, there can be no means of access of germs till the milk leaves the udder, and there can be no serious development, under any circumstances, till some time afterwards. It may not be practicable to exclude germs entirely from milk, but it certainly is quite practicable to considerably restrict their numbers.

Germs need no human agency to put them into milk, but human agency can achieve much towards keeping them out, and this much at least is the plain duty, and should be the common aim of every man associated with the milk business. We cannot hope, nor would it be desirable, to exterminate germs from the earth. They will always be present to some extent, in the air we breathe, the water we drink, and on practically everything we handle. Fortunately, however, the majority of germs are harmless, while some of them are actually used to improve the texture and flavour of our bread and butter, and other important foodstuffs.

The changes which germs may effect in milk are not all harmful. In fact, for adults at least, milk is considered by many authorities as being the better for souring, provided the lactic acid germs responsible for souring are not associated, in the process, with objectionable organisms.

As a matter of fact, given a sufficient development of lactic acid organisms in milk, it is very unlikely there will be any very serious number of dangerous germs along with it. The lactic acid is too much for them. This is the basis of Metchnikoff's advice "to drink plenty of milk, preferably sour." His theory was that the presence of plenty

of lactic acid organisms in the lower digestive tract tended to keep down the harmful putrefactive organisms.

Souring, together with consequent thickening of milk, is one of the commonest first evidences of its decomposition. This is due solely to germs that have been allowed to develop into the necessary myriads. Souring is an evidence of germ development, but it has to be said for the lactic acid germ that it lets us know it is there. The more objectionable germs do not reveal their presence quite so unoffensively. I refer mainly to the putrefactive varieties. Putrefactive germs are, of course, those varieties which decompose organic matter by causing it to putrefy or rot, and, incidentally, give off that characteristically stinking odour of putrefaction. These organisms work on nitrogen, which exists in the proteins of milk in a form particularly acceptable to such germs. Some things in nature are more difficult to preserve than others. Speaking of such things, we say they will not "keep." Those things which will not keep—which putrefy readily—are invariably the proteins, an essential component of which is nitrogen. Butter will keep very much longer than milk for the reason that there is hardly any protein in butter. The nitrogen of milk is in the casein or curd which goes off in the buttermilk. Substances that contain organic nitrogen, and particularly moist organic-nitrogen, require some special treatment to preserve them from the ever waiting germ.

The first of these processes is drying, which checks the multiplication of germs, by depriving them of vital moisture. The farmer exploits this system when he makes hay. Then there is the process of total air exclusion. This deprives the germs of the usually vital oxygen. This is a system used by the farmer when he makes ensilage. Another process is cooling, which deprives the germs of the warmth that favours their numerical increase. The dairy farmer uses this system when he refrigerates his milk. Again, more or less intense heat actually kills the germs; the dairyman is applying this principle when he boils or steams his dairy utensils, and also when he pasteurises his milk.

Though any one of these processes will at least check putrefaction, some are entirely out of the question when it comes to providing a milk that will meet the daily needs of the people. For a city milk supply, we are practically dependent on two or, at most, three measures of germ prevention. The first and most important is limiting the initial entry of germs by practising the utmost cleanliness and heat sterilization of all utensils. The second is cooling the milk to as low a temperature as is commercially practicable, and the third is pasteurization, which means applying heat for a certain extended time to the milk itself, but only in such degree as will not affect its principal food virtues. Germs cannot be kept entirely out of milk, but the men responsible can go a long way towards doing so by observing even no more than the first two measures mentioned, namely, unrelaxing cleanliness and early reduction of temperature.

Fortunately, we have in these days a means of determining whether germs are in milk in serious numbers without having to wait on their damage becoming either visible or odorous. This is by the microscope. The number of germs in a milk may not be an exact measure of its

menace because numerous germs of one variety may not be as harmful as only a few of some other variety, but a high bacterial count is certainly indisputable evidence that there are conditions, somewhere in the milk's course, that need remedying.

Though a low bacterial count cannot be regarded as absolute evidence of a milk's suitability, a high count is undoubtable evidence that the milk is abnormal, and consequently dangerous at least. So much responsible are germs for the common deterioration of milk that high bacterial count and milk deterioration may be regarded as one and the same thing. The dairyman's only chance of arresting milk's deterioration is by efforts directed at the germ content. If those destroyers of milk have not been kept down to the safety limit, the resulting deterioration must be laid at the door of the man who permitted it.

When milk is found unduly deteriorated, one can be quite sure that it is due to either one or more of the following causes:—(1) Too many germs entering in the first place through human failure to exclude germ-laden foreign matter, or to sufficiently cleanse the utensils; (2) too quick multiplication of already entered germs through allowing the milk to remain at too high a temperature; (3) too great a multiplication of germs through allowing too long a time to elapse since the milking.

Condensed, these three main causes of milk deterioration are:—General dirtiness, inadequate cooling, and excessive age. All are well within human control. Sometimes the udder itself, through being diseased, will contaminate milk before it leaves the cow. In such case the germs are of the pathogenic variety, and are identifiable as such under the microscope.

It must not be thought that so much reference to germs means that milk is an over dangerous food. The writer set out to give the commonest causes of milk deterioration. Fortunately, in Melbourne's milk supply, at least, undue milk deterioration is rare; at least up to the time the householder receives it.

In this connexion a warning to consumers may not be out of place. Germs are abundant enough even if we be as cleanly as we can. If we are not scrupulously clean with the milk that we give our infant children at least, then we are actually inviting disease and disaster. A milk vessel merely not quite clean is a direct menace to health, to say nothing of its putting to nought all the efforts and care of the milk's preceding handlers. I would like to add a word or two to housewives about one form that this thoughtlessness sometimes takes—that is the placing of money in the jug or the billy left out for the milkman. Unless that money has been boiled first, depend upon it, it is germ-laden. It has been in some one's pocket with other money from almost every one else's pocket, and though every pocket is germ-infested, there is none likely to be more so than the money-pocket.

The coin may have been only yesterday in the filthiest pocket of the filthiest man in Melbourne, or even in the pocket of a consumptive, along with his sputum-smeared handkerchief. If so, those tuberculosis germs will certainly be on that money, and, almost certainly, still actively alive. No decent milkman wants to put his hand in a customer's milk jug, not even for money. The jug is contaminated by both

the germ-laden money and the germ-laden hand. When the milk goes down your children's throats, the disease germs go down also. The possibilities are not confined to tuberculosis germs either. There are plenty of other more commonly money-borne organisms quite capable of causing serious home trouble if the family milk be offered to them as a vehicle of entry. The city's milk supply cannot be blamed for any death thus caused. Once the milk billy or jug has been cleaned, put nothing in it but boiling water.

MARMALADE.

By Miss A. Knight, Fruit Preserving Expert.

Several varieties of citrus fruits are available in the season, so that an assortment of marmalades can be prepared.

Certain kinds of oranges, such as Seville, Pomelo or Grape Fruit, Poorman, and others of the sour variety (usually called "jam" oranges) are mostly favoured, though some people prefer to use the sweet kinds, as Navel, Valencia, &c., chiefly because of the mild flavour. All varieties, however, are suitable. It is largely a matter of preference.

Any of the "jam" oranges will give a more attractive product, and also a bigger quantity, than that made from the sweet kinds; the latter have a much denser appearance and a milder flavour.

A really good marmalade should be tender in texture, and when cut with a spoon should be just firm enough to retain its shape, and also present a sparkling appearance where cut. It should not be thin enough to be called "syrupy," nor should it be tough. The pieces of peel should not be the least bit hard, and should be evenly distributed throughout the mixture.

In making marmalade the best pan to us is an ordinary preserving pan of medium size, with a broad surface. The aluminium pan is very suitable, being light in weight and easy to clean; also, the metal conducts the heat rapidly to the top of the pan, and thus the contents are more evenly heated. Any other kind of preserving pan could, of course, be used.

For cutting or slicing the oranges there are different types of small machines on the market, and these simplify the work, though a well-sharpened knife will give equally good results, but cutting by hand is, of course, a slower method. It is always advisable to frequently wipe the cutting blade, either of knife or machine, while in use; otherwise the clean skin will become discoloured with the stained juice on the blade.

For any of the marmalades select fruits even in colour. Some prefer the deep, and others the pale skins. Also, when possible, choose them free from scabs or other skin blemishes.

There are several different ways of cutting the oranges. The class of marmalade most generally favoured is that with the finely shredded fruit appearing evenly throughout the jelly. To make it, thoroughly

cleanse the fruit; then weigh it. Halve it, and remove the centre "core" or "rag," which is usually rejected; then quarter the fruit, and tear out the pulp. The dry skin is much easier to shred than the whole orange. Cut the skin as finely as possible, and put into the preserving pan, then add water. If the "jam" oranges (such as Seville, &c.) are being used, allow one quart of water to each pound of fruit, but if the sweet kinds (as Navel, &c.) only one pint to the pound. Allow the skins to steep in this over night. Next day add the cut up pulp, and simmer altogether until quite cooked. Stir very gently during the cooking, so that the pieces of shredded peel will not be broken.

The cooking usually takes from three-quarters to one hour. When cooked measure it, and allow an equal measure of sugar, that is, for each cup of pulp and juice in the pan add one cup of sugar. When the sugar has quite dissolved boil the mass rapidly, skimming if necessary till the setting stage is reached. This may be ascertained by putting a very little on a plate, and when quite cold cutting it through. But a quicker and easier method is to dip the stirring rod in the jam, hold it up and watch the drops as they fall from the rod. If the marmalade is ready to set these drops will fall heavily in sheets or flakes, instead of being round and light. When this stage is reached lift the pan from the fire, and allow the contents to cool very slightly before bottling. Have the jars or containers thoroughly clean and dry. If glass jars are being used, bind them round with a piece of damp cloth while pouring the hot jam into them. Allow them to get quite cold before sealing.

Orange Conserve.

A simple and effective method of making either Pomelo or Grape Fruit, or Poorman conserve is to cut each orange into quarters, or eighths (according to size of fruit). Take out the pips without jagging the pulpy portion. Allow a quart of water for each pound of orange. Cook gently until the skins are tender, but not broken. This will probably take about an hour.

Then measure the whole (as one would for jelly) and add an equal amount of sugar. After this has completely dissolved the boiling should be very rapid. The mixture will then soon respond to the test for setting, perhaps within fifteen or twenty minutes. As soon as it does remove the pan from the heat, and allow it to cool off slightly before bottling.

When setting the conserve into the containers see that a fairly even distribution of fruit is in each jar. Seal it when quite cold. It is of importance, when making a conserve of this kind, to aim at keeping the sections of fruit as unbroken as possible. This adds greatly to the appearance.

Another mode of preparation for orange conserve is to cut the oranges into even slices, rejecting the first and last slices (which should be skin only). Then cook the unpeeled slices gently in the water, about one and a half pints to each pound of fruit until tender.

This conserve also requires an equal measure of sugar, and is then finished in the same way as that just described for the quartered

fruit. Another variation could be made by combining orange, banana, and pineapple. This would also be made in the same way as the others, the quantities being—

3 lb. jam oranges.
1 lb. (or a little more) of pineapple.
1 lb. of bananas.
3 quarts of water, and an equal measure of sugar, the same as for marmalade.

Still another one, which is sometimes called "Mock Orange Marmadale," consists of 2 lb. of grated carrot to each pound of thinly-sliced orange made in the usual way.

In some homes, particularly where marmalade is used to any extent in conjunction with baked or steamed puddings, or in pastry, &c., a very effective and quick way to prepare a quantity for the purpose is to pass the orange skin through the mincer. This saves much time in cutting, and gives an even grain through the mixture, which makes it very suitable for cooking purposes.

When this method is adopted the orange should be first quartered, then the skin and pulp separated. It is the skin only which is passed through the mincer. The juicy part of the orange may be cut up and added, together with one and a half pints of water to each pound of orange used; then make in the usual way. When making this particular kind of marmalade one must be sure that the pieces of skin are quite tender before the sugar is added, otherwise the finished product has an inclination to harden with keeping.

CURING A SELF-SUCKING COW.

The following letter is reproduced from an English journal:—"I had a Guernsey cow that sucked herself. I was of the opinion that the butcher was the only way to cure her, but I have changed my mind. I made a halter and harness for her, and when she is out in the pasture I put it on and leave it on. Take an ordinary horse halter, or make one with a ring at the bottom. Buy two halter chains and fasten the two chains into the ring of the halter so that they cannot come loose. Now take a wide strap (I am using an old carriage harness saddle) and fasten it around the cow's body just back of the forequarters. In the strap fasten two rings, one on each side, large enough to pass the chain through. These rings should be fastened about 15 inches from the top. Now take one chain that you fastened to the halter and put through ring on the outside of strap or saddle and the other chain through the other ring. The chains should have snaps, so that you can adjust them. Do not make them too short at first, and every time the cow sucks herself make them shorter until it is impossible for her to do it. Do not get the band around the girth too tight, otherwise it will make a sore back."

BLACK SPOT OF THE VINE.

Though little or no damage was caused by Black Spot last season, traces of it are frequent on sultana canes in many districts. The scars are not conspicuous; their development was arrested by the dry weather that supervened. The fungus is nevertheless present at innumerable points throughout most vine blocks. It needs only a showery spring to cause a disaster to vines that are not adequately protected.

It is unnecessary to urge the effectiveness of the acid iron swab in destroying the wintering forms of the fungus, thus delaying considerably the first appearance of the disease. Swabbing does not altogether do away with the need to spray with copper fungicides later on, but it renders the subsequent protection of the vines much easier.

Vines can, no doubt, be protected solely by copper sprays, such as Bordeaux, after the buds have sprouted; in a showery spring, however, this entails repeated sprayings at short intervals. On vines that have been swabbed the fungus does not show up nearly so soon, nor is it so abundant, and far less protective spraying is needed. Swabbing, though an unpleasant process to execute, is well worth while.

The usual formula for the swab is—

Hot water	10 gallons
Sulphate of iron	20 lb.
Sulphuric acid	8 lb.

This solution is very corrosive, and must be prepared and handled with care. It can be either swabbed or sprayed on to the vine, but special spray pumps are necessary to withstand the solution. The best time to swab is just before the buds commence to swell, in very early spring.

For further particulars see *Bulletin No.* 42, *Anthracnose or Black Spot of the Vine*, obtainable, post free, on application to the Director of Agriculture, Treasury Gardens, Melbourne.

ORCHARD AND GARDEN NOTES.

E. E. Pescott, F.L.S., Pomologist.

The Orchard.

If the winter spraying has been delayed, it should be completed as quickly as possible, and before the buds begin to swell and burst.

It is not advisable to spray the stone fruits with the red oil emulsion at this time, as there is danger of burning and destroying the early buds that may be swelling, and consequently loosen their outside scales. It will be safe, if the work be done at once, to spray apple, pear and quince trees with this spray, especially where the Byrobia Mite, scale insects, or woolly aphis are prevalent.

If it is intended that the lime-sulphur wash be the specific for these and other pests, it may be used with safety, although the spraying should be completed as early as possible.

That the lime-sulphur is valuable as a specific against "Black Spot" of the apple was shown in the report of the experiments in the *Journal of Agriculture* for August, 1918. The first spray should be given when the flower buds are more green than pink; and the second spray, when the centre flowers of the blossom cluster are pretty open.

The same report showed that a spray of 6.8.40 of copper-soda, sprayed when the earliest buds were showing pink, was a complete success against the "leaf curl" of the peach.

Where peach aphis has appeared, it will be advisable to spray at once with a strong nicotine solution. Tobacco stems should be soaked in cold water for some days, and a teaspoonful of caustic soda added to a cask of steeping stems. The liquid should be made strong, and every endeavour made to kill out the first insects that appear. The preparations known as Black Leaf 40 and Nicotine Sulphate are useful for this work.

Experiments carried out by the Government Entomologist in 1923 determined that red oil and nicotine sulphate mixed provided an efficient spray for woolly aphis. The mixture was made up of 1 gallon of red oil, 1 pint of nicotine sulphate, and 1 lb. soap, the latter being boiled till dissolved in 1 gallon of water. The red oil was then mixed in, and lastly the nicotine sulphate. To this was added 80 gallons of water. This provided spray material for 100 trees, at a cost of about 11s.

The pruning of deciduous trees should be at an end this month. The pruning of evergreens such as oranges, lemons, and guavas, may be left until later.

Young deciduous trees must be planted not later than this month. The soil should be trodden firm round the roots, and, when planting has been completed, the tree ought to be headed back to three or four buds on each arm.

Preparation may be made for planting citrus and other evergreen trees. It is necessary that the soil be well ploughed and sweetened in anticipation of planting in September and October.

In root-borer affected districts, the beetles will begin to appear during the latter part of the month. A close observance should be kept on them and the insects regularly collected and destroyed.

The Flower Garden.

All winter-flowering shrubs that have dropped their blossoms may now be pruned. It is important to prune these immediately after flowering, so that the plant may be able to make plenty of flowering wood for next season.

Seed beds and plots need constant cleaning and weeding. Weeds must now be kept out of the garden, both by hoeing and hand picking. The seedlings growing in their permanent situations should be thinned out and given a good chance to develop strong and sturdy plants.

Divisions of herbaceous plants such as delphiniums, cannas, shasta daisy, herbaceous chrysanthemums, rudbeckias, salvias, and phlox may still be planted out. If it is intended to leave the plants in the places they occupied last season, they should be lifted, the soil being well dug and manured, and the crowns planted back again. By this means the plants retain their vigour, and are able to produce good flowers each season.

Evergreen shrubs may now be planted out, if the spots chosen for them have been well dug and aired. All beds should be well dug over by this time, manure and refuse litter having been dug into the soil.

A few corms and tubers of early summer flowering bulbous plants, including Gladioli, may now be planted. Gladioli so planted will bloom in December.

The Vegetable Garden.

The plots should be well dug over at this time, adding gypsum or lime where any pests have been prevalent. In other beds stable manure should be well worked into the soil.

The soil should be rich, well worked, and warm, so that a quick growth may result. Vegetables quickly raised are generally more tender than slowly grown ones; and frequent changes of crops in the plots will give better results. At this season, the weeds will require constant checking; frequent use of the hoe will, therefore, be necessary, and in the rows hand-weeding should be resorted to.

All seedlings should be planted out, especially seedlings of cabbage, cauliflower, lettuce, and onion. Seeds of peas, carrots, parsnips, radish, lettuce, tomato, and broad beans may be sown. Add 2 oz. per square yard of nitrate of soda to the cabbage beds.

Where they can be sheltered and protected from frosts, young tomato plants may be planted out for early fruiting. One method of managing these early plants is to place the young plant a few inches below the surface, and then a box, 8 or 9 inches deep, with top and bottom removed, over the plant at ground level. This can then be covered loosely with a piece of glass whenever necessary.

Potatoes, artichokes, and asparagus crowns may be planted. Asparagus beds should be kept free from weeds; they should have a loose surface, and a good top dressing with old manure would be beneficial.

In the frames, cucumber, vegetable marrow, melon, pumpkin, water and rock melon seeds may be planted. These are best planted in pots, placing three or four seeds in each pot; they then suffer no check when being transplanted into beds.

The Growing of Cabbages.

The main plot for cabbages should be a rich, well prepared soil. Soils supplied with humus, or rich alluvial soils, do not need such heavy manuring, but it is always well to remember that cabbages are very gross feeders. In the case of poor lands the grower should plough or dig in well-rotted farmyard or stable manure, and, where this manure is not available, artificial nitrogenous manures must be used. In any case, better results are obtained when both are properly combined.

A good artificial manure is blood and bone and superphosphate, applied at rates of not less than 6 cwt. per acre. Cabbages will always respond to a top-dressing of either nitrate of soda or sulphate of ammonia (at the rate of 1 cwt. per acre), especially when the "heads" are just beginning to form. These manures (nitrate of soda and sulphate of ammonia), contain nitrogen, which tends to produce leaf growth in plants of any description.

The surface of the ground should be made firm and the plants planted out in rows. The large commercial cabbage is planted about 30 inches between the rows, and about 24 inches between the plants. Naturally, if one of the smaller varieties is grown, the distances can be reduced. If the soil be of poor quality, however, the plants must be given more room and planted 3 feet by 3 feet. On very rich soils the distances can be made rather less than 30 inches by 24 inches to prevent tendency of the cabbage growing too large. Very large "heads" are not desirable from a housekeeper's stand-point, and so should be avoided.

When transplanting, it is advisable to see that the soil is firmly pressed down all round the planted seedlings, and a watering at this stage is most beneficial. Some growers, when dealing with very healthy and

well developed plants, cut part of the main root before transplanting into the main plot. When the planter does not grow his own seedlings, he should not keep the plants obtained from the seedsman too long out of the ground.

During the growing period the cabbage must not receive any check in its growth. The best cabbages are those which have grown quickly and steadily, and the grower should aim at producing solid, compact, and sizeable cabbages. The use of plenty of lime or gypsum in soil will help plants to combat finger-and-toe and club-root diseases. Spray for cabbage aphis and moth with nicotine sulphate.

Early Varieties.—Sow seed February to April. Varieties, Enfield Market and Early York.

Midseason Variety.—Sow seed in winter. Variety, Flat Parisian.

Main Crop or Late Varieties.—Sow seed from July to November. Varieties—Allhead, St. John's Day, Drumhead, and Succession.

Savoy or Winter Cabbage.—Sow in midsummer and plant out as quickly as possible.

Brussel's Sprouts.—Sow seed in winter and spring, planting out as quickly as possible.

REMINDERS FOR SEPTEMBER.

LIVE STOCK.

Horses.—Feed stabled horses well; give green stuff if available. Continue rugging to encourage the shedding of the coat; good grooming will also be beneficial. Give hay or straw to grass-fed working horses. Feed old and badly-conditioned horses liberally. In foal mares due to foal early, if worked, should be turned out to paddock. Stallions doing stud duty should be fed liberally. Equivalent amount of cracked Indian corn (maize) may with advantage be substituted for oats, if latter grain is scarce.

Cattle.—Cows should still be rugged, but coverings should be removed frequently, in order to enable the animal to get rid of the old coat, or, better still, a good curry-combing may be given. Continue hay or straw. Look up treatment for milk fever in leaflet issued by Department, and treat cattle accordingly. Give calves a good warm dry shed. Give the milk to young calves at blood heat. Have feeding troughs or buckets clean. Don't over-feed. Feed regularly with regard to quantity and time. Provide a good grass run, or fine hay or crushed oats in a box or trough. Give a cupful of limewater per calf per day in the milk. The problem with many at the present time is how to rear calves without milk. This can be done very well by starting them on new milk for a fortnight, and then gradually substituting the milk with one of the calf meals on the market. To these it would be advisable to add two or three tablespoonfuls of cod liver oil. The following meal is in general use in Ireland:—Two parts, by weight, of oatmeal, 2 parts maize meal, 1 part pure ground linseed, all finely ground. Scald with boiling water, and allow to stand for twelve hours. Start with new milk, then gradually substitute skim and ¾ lb. of the meal mixture per head per day, gradually increasing to 1 lb. or more. In a month milk may be dispensed with altogether. The crushed oats, fed dry, have been found to give excellent results.

Write for Departmental Bulletin on rearing calves.

Pigs.—Supply plenty of bedding in warm well-ventilated sties. Keep sties clean and dry, and feeding troughs clean and wholesome. If pigs are lousy dress with kerosene emulsion or sulphur and lard, rubbing well into crevices of skin, and disinfect sties. Worms are very prevalent at present, and may be treated by giving 2 to 10 grains of Santonin in form of pill, or from half to one teaspoonful of oil of turpentine in milk or castor oil. Read Bulletin 16.

Sheep.—Early-shorn sheep usually thrive, and can be fattened quickly. This is important where it is intended to sell old ewes that are of no further use for breeding purposes or for wool production. Strong Crossbred two-tooth wethers that were unsuitable for export can also be fattened quickly when shorn. Lambs not good enough for freezing should also be shorn early, as they will then fatten on the spring grass, and may be made good enough for the butcher.

Suitable shelter should be available for the protection of sheep off shears, particularly in the early spring months. Where insufficient knowledge of classing crossbred wool exists, draft the coarse sheep from the fine sheep before they enter the shearing shed; there will then be no difficulty in baling the wool separately. All dags should be removed before the sheep are carried by the shearers to the board. When the wool is on the table, avoid deep and careless skirting on small flocks; only very seedy parts, heavy fribs and stains should come off fleeces. Press in a box press, which forms square sides to bales. A printed pamphlet, setting out the quantity of wool of each class to be put in a bale, is to be had from most wool-selling firms. Brand bales boldly and neatly on the flat side, or adopt any particular directions suggested by your wool broker.

The shed should be very well cleaned of all straw, chaff, dust, &c., before shearing starts; also wash the shearing board down, and at the same time add some disinfectant to the water. Cut back all misshapen feet at shearing time,

and treat if necessary. All sheep off shears should be branded clearly; avoid branding on ribs and shoulder; use rump and poll for this purpose. Broken-mouthed ewes, ewes with faulty udders, yellow and common fleeces should be culled and fattened for sale. Well-bred ewe weaners should be classed, and the best retained for future flock purposes. Wool with character deep-stapled, fine to medium grade, will be in keen demand for years. Character is denoted by the crimp, which should be even and well defined.

Place wool pack in press with the sewn seams towards the fixed side of the press.

Poultry.—September is the last month for hatching for winter eggs. Incubators should be kept going, and broody hens set. Care must be taken to keep down vermin, as they now breed quickly; use sprays in houses—nothing stunts chickens quicker than vermin. The food for young chicks should fine oatmeal, biscuit meal, or finely-ground wheat, a little calcined bird's grit, a little chopped green stuff, such as lettuce, thistles, or green lucerne or spring onions occasionally cut fine is a good tonic, and a pinch of powdered charcoal. Slightly moisten with new milk. Make the whole friable, and feed frequently ("little and often") just as much as they will readily eat, as an excess of food only sours and disturbs their digestive organs. Animal food may be given in small quantities after the first ten days once or twice a week. Chickens should be protected from damp ground and the cold, bleak winds.

CULTIVATION.

Farm.—Plant early potatoes, and work up fallow for the main crop. Keep fallow for summer forage crops well worked up with the disc and harrows. Make early sowings of mangolds, beet, field carrots, and turnips. Push on with the fallowing in the Northern Districts. Prepare land for tobacco seed beds by burning rubbish on the site; afterwards work up to depth of three or four inches.

Orchard.—Commence spring ploughing; plough in leguminous crops for green manure as soon as the plants are in full flower. Finish grafting early in the month. Spray peach and apricot trees with copper soda as the blossom buds are opening, as a preventive of "leaf curl" and "shot hole" fungi; watch for peach aphis, and spray when present with tobacco solution.

Flower Garden.—Cultivate and work up the surface to a fine tilth—clear out all weeds. Water newly-planted shrubs, &c., if the weather is dry. Plant out cannas, early dahlias, chrysanthemums, gladioli, and other herbaceous plants.

Vegetable Garden.—Plant out seedlings. Sow seeds for summer use, such as tomatoes, cucumbers, marrows, pumpkins, melons, &c. Plant out tomatoes, and shelter till frosts are over. Hoe and work up the soil surface.

VINEYARD.

Plantation of young vines (grafted or ungrafted) should be concluded before the commencement of September; pruning of old vines likewise, as well as twisting or tying of rods on long-pruned vines. Prune recently-planted vines just before buds commence to swell (if not pruned when planted), cutting strongest cane back to two buds. Do not delay this work until buds have shot, as this seriously weakens the young vine. Field grafting may be carried out, if weather be fine and warm. If cold and wet, postpone until October. Swabbing of susceptible sorts (Black Spot control) should not be omitted this wet season. It must be completed before vine buds swell (see last month's reminders). A bulletin (No. 42) dealing with vine Black Spot, will be posted on application. Cultivation (scarifying or discing) must receive attention when soil is in suitable condition.

Cellar.—Conclude spring racking early in month, if not already done. Fill up, regularly, all unfortified wines.

BEEKEEPING.

During the first or second week of September all hives should be examined to see that each colony has a laying queen and sufficient stores of honey to permit of normal development. Bees work better with a reserve of stores at this time of year, and when their supplies are reduced to a certain minimum, brood rearing is restricted, and may cease altogether for a time, and when, as a result of prolonged unfavorable weather, the reserve stores are used up, even sealed brood may be torn open and thrown out, and the colonies practically ruined for the season.

Strong colonies should have 15 to 20 lb. of honey ahead of daily requirement, medium and small colonies proportionately less. When during the examination of the hives less than this amount is found, the shortage should be made good by feeding, blood-warm, and inside the hive, a syrup made by dissolving 1½ or 2 parts of best white sugar in one part of boiling water. What is known as a frame feeder is the most suitable one for this purpose, or a simplicity feeder in a shallow super over the brood chamber may be used.

When no feeders are on hand, the syrup may be poured in a fine stream from the lip of a jug into an empty comb laid flat into a suitable dish. The jug should be held about 12 to 15 inches above the comb, otherwise the syrup will not enter the cells. After filling both sides, and keeping it in an upright position for a few minutes to drain off the surplus, the comb can be returned to the hive, repeating the operation on succeeding days till the needs of the colony are supplied. Honey of unknown origin should never be used for feeding on account of the risk of introducing disease.

Any colony found queenless, as indicated by the absence of brood or eggs, may be kept going till a queen can be raised or procured, by giving a comb of eggs or young brood from a strong colony once a week, provided there are sufficient bees left to make it worth while; if too small, unite with the nearest normal colony.

In early districts and where colonies went into Winter strong in bees, swarms may be expected from the middle of September onwards. Hives and frames for the number of first swarms expected should be on hand and ready for immediate use, so that none of the bees' labour may be wasted by allowing them to build comb in a temporary box. All frames should be wired so that newly built comb may not break down in handling or during hot weather. Under normal conditions a swarm with a good fertile queen will build all worker comb during the first three weeks. It is the only time a full colony will not build drone comb from starters of foundation. While the queen deposits eggs into the worker cells as fast as they are constructed by the bees there will be no drone cells built. After three weeks the young bees from the first-laid eggs will hatch out, and the queen will return to that part of the comb to again deposit eggs into the vacated cells, and the newly-constructed cells on the edges of the comb being neglected by the queen, the remainder of the space in the frames will be filled with drone comb.

The aim of the bee-keeper, therefore, is to confine the building of comb from starters to the number of frames likely to be completed during the first three weeks after hiving the swarm, by removing two, three, or four frames in which no comb has been built four or five days after hiving. The follower or dummy board is pushed up against the remaining frames, and when these are completed frames with full sheets of foundation are added to make up the set.

Hives should always stand level, crossways to the frames; in the case of swarms hived on starters of foundation it is particularly important. Comb is always built truly perpendicular, and if the hive is not level to the frames the wires will be outside, instead of in the centre of the comb.

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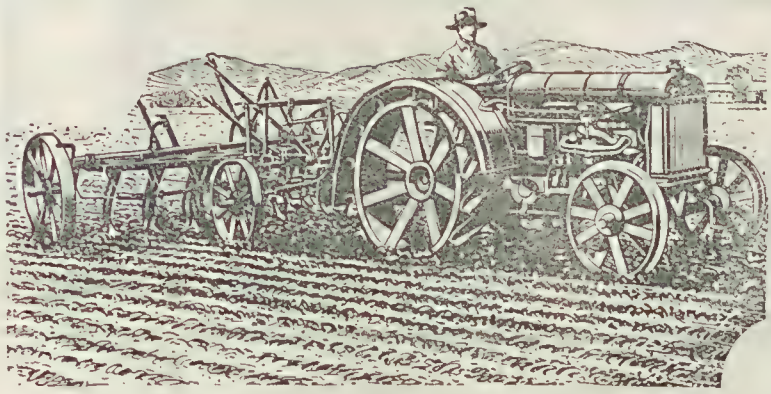

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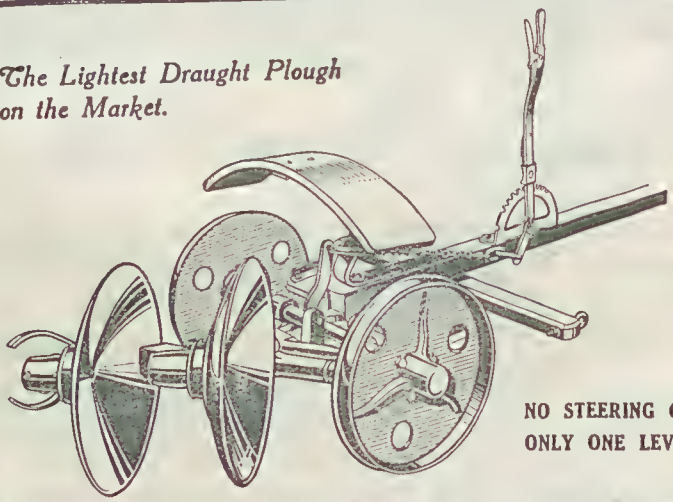

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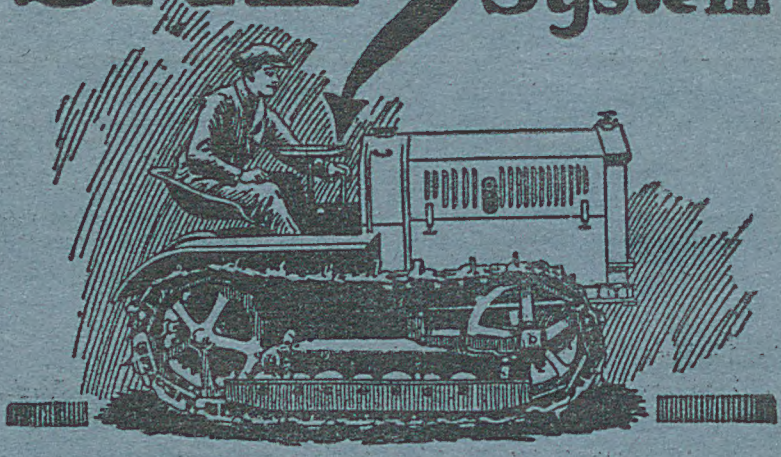

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